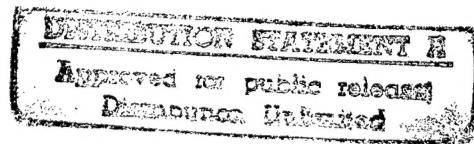


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Science & Technology

CHINA: Energy

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Science & Technology

China: Energy

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**Primary Energy Output Hits 1.06 Billion Tons
(Standard Coal)**

916B0036A Beijing JINGJI RIBAO in Chinese
11 Jan 91 p 3

[Article by reporter Xie Ranhao [6200 3544 3185]]

[Text] Ministry of Energy Resource authorities have addressed the initial recommendations of the 1991 national energy development plan. From its make-up it is apparent that the pace of energy growth will be less than that of the national industrial growth plan. The central theme of the energy system will be, as it was at the start of 1990, to tap the latent power of domestic energy and to strive for efficiency of labor and economic profits.

Objectives of the 1991 national energy growth plan are to reach a total primary energy volume of 1.06 billion metric tons (standard coal), of which coal will be 1.11 billion tons, crude oil 139.3 million tons, natural gas 15.4 billion cubic meters; 645 billion kWh of electric power, of which 123 billion kWh will be hydroelectric power; and a savings of 10 million tons (standard coal).

Fixed capital for the 1991 national energy resources industry will be in the range of 70 billion yuan or more, of which the coal industry total will be about 10 billion, setting a new increased capacity of 24.7 million tons, and attempts will be made to get 33 million for starting new operations. The total investment for the electric power industry will be on a scale of 27 billion yuan—efforts will be made to raise that to 30 billion—and a planned new installed capacity increase of 6.6 to 8.6 million kW, of which hydroelectric power will be 840,000 to 1 million kW. Total investment for the petroleum industry will be in the range of 24 billion yuan, setting a new increased crude oil production capacity of 13 million tons, and a natural gas production capacity of 500 million cubic meters.

The plan for the nuclear industry is to start up operations of the phase-one 300-megawatt unit at Qinshan, and make preparations for phase two, and to continue construction of the Daya Bay nuclear power plant in preparation for its operational test in 1992.

In addition, there will also be an investment for technological reforms in the energy industry of over 6 billion yuan for the year.

Based on the above mentioned plans, the total national investment for primary energy in 1991 will be only 2 percent over 1990, and for electric power only 4.9 percent over 1990. This increase is not only lower than that of the Seventh 5-Year Plan, it is also lower than the 6 percent rate of increase for the national industrial growth plan for 1991.

The national energy supply shortage situation has not yet been reversed, and in fact, for many years it has not been able to keep up with the requirements for the development of the national people's economy, and invariably

the gap between supply and demand continues to reappear. Experts point out that the 1991 energy increase rate, and capital construction investment are out of balance, and could, in future, again to lead to gaps in supply and demand, or have the after-effect of retarding energy industry development. They say that in order to avoid this sort of situation the entire society must thoroughly adhere to the energy conservation policy, and at the same time there should be an unrelenting bias for granting preferential investments in energy.

**Greater Effort From Energy Sector in Eighth
5-Year Plan**

916B0036A Beijing RENMIN RIBAO in Chinese
20 Jan 91 p 2

[Article by Xinhua reporter Zhang Chaowen [1728 6389 2429] and reporter Liu Biyang [0491 6239 7122]]

[Text] On arrival of the new year, the Ministry of Energy Resources held an unprecedented National Energy Resources Work Conference, calling on leaders from the coal, electric power, oil, and nuclear industries, and many famous energy experts and professors to assemble in Beijing. The central purpose was to identify those areas where China is lagging behind advanced world levels in energy resources, and to raise the labor production rate and economic profits of China's energy industry. This was a mobilization meeting to develop "quality, product diversity, and profits" in the energy industry.

In the Seventh 5-Year Plan, China made real headway in the energy industry. Coal output reached 1.09 billion metric tons, maintaining first place in the world; annual generated electric power was 615 billion kWh, 4th in the world; annual petroleum output was 133 million tons, maintaining a steady high output, and was 5th in the world. The pace of development, labor production rate, safety, and reducing consumption of energy are all setting new records.

Compared with other industries it is not a slow pace of development, but energy experts brought out statistics at the conference that reveal many gaps remaining between China's energy industry, and advanced world levels. For example, mechanized coal extraction at China's coal mines, during the Seventh 5-Year Plan, increased by 20 percent, and coal production per worker only decreased by 4.3 percent. Each domestic composite coal extraction facility required 150 workers, some over 200, twice that of foreign facilities; and the operating time for composite coal extraction facilities used in mines was only 23 percent, or 60 percent behind that of developed countries. Consumption of materials, production safety, construction time, and cost reduction, all lag far behind.

To identify these gaps, the Ministry of Energy Resources called a series of brain storming sessions, and drew up gap reduction measures. It was said, after striking out all of the incomparables, if the energy production facilities could but achieve their own designed standards, and if

they could but beat their own records and advanced in-country levels, it would go a long way in helping China's energy industry, and greatly reduce the gap behind advanced world levels. How best to reach these objectives; how best to overtake the enterprises' own best records, and national advanced levels, is what the Ministry of Energy is asking.

It was decided at this meeting that beginning in 1991 the energy industry wants simplified organization, stronger quotas and management, and grass-roots level actions to bring about increased labor and economic gains. Attendees feel the key to raising profits is a simplified organizational structure. This is a major problem everywhere. Minister Huang Yicheng said, "The organizational structures of energy enterprises are over staffed, and proliferation of technical offices is endemic". It has been found that there is an average of 40 offices in the mining affairs bureaus of the various mines, far exceeding prescribed leadership complements. Every electric power bureau, and mining affairs bureau will be tested, one bureau chief will be installed, there will be no deputies, and they will run a few model technical offices; and the Ministry will adhere to this rule.

The leadership and comrades of various levels of the Ministry of Energy will now assiduously study and carry out the spirit of the National Energy Resources Work Conference; they will take aim at advanced world levels during the Eighth 5-Year Plan, and will identify their own gaps. These actions on behalf of China's energy industry's quest for quality and profits will be undertaken everywhere.

New Era Seen Dawning for Energy Growth 916B0036C Beijing RENMIN RIBAO HAIWAI BAN in Chinese 4 Feb 91 p 1

[Article by reporter Zhang Heping [1728 0149 1627]]

[Text] Minister Huang Yicheng of the Ministry of Energy Resources, who has charge of four basic industries—coal, electric power, petroleum, and nuclear—well knows the burden that he carries on his shoulders. In their recommendations for the 10 year program, and the Eighth 5-Year Plan, the central authorities made it clear that they mean to develop the energy industry on a large scale, and that capital construction of energy and other basic industries would be the key to economic construction in the coming 10 years, and during the Eighth 5-Year Plan. Whether the energy industry will get priority in the Four Modernizations effort depends directly on the progress of secondary strategic objective, which is to see that the people are comfortably well off.

What will be the pace and scale of China's energy industry in the coming 10 years? Minister Huang told reporters that in the next 10 years the energy industry faces the serious challenge of finding ways to guarantee the requirements for a comfortable livelihood, to sustain the people's economy, and to have coordinated and steady development. The energy industry's objectives

are to achieve in 10 years the beginning of a turnaround in the situation of energy shortages, and to meet the requirements for raising the people's economic development and living standards.

Huang Yicheng said that to reach these goals, the Ministry of Energy Resources initially intends, through the Eighth 5-Year Plan, by 1995, to achieve a national primary energy output of 1.2 billion tons (standard coal), of which raw coal will be 1.26 billion tons; petroleum 175 million tons (oil equivalent), that is to say, crude oil 155 million metric tons, natural gas 20 billion cubic meters; and 870 billion kWh of electric power.

Minister Huang confidently made his calculations; if the goals of this plan can be realized there will be a 3 percent growth rate in coal, oil, and other primary energy resources, and about a 7 percent annual growth rate in secondary resources and electric power. This rate can basically satisfy an average annual growth rate of 6 percent in the gross value of national people's production for the next 10 years, and annual growth of about 7 percent in gross value of industrial and agricultural production.

What will the scale of energy industry construction have to be to reach the above production objectives?

Huang Yicheng stressed that the energy industry would have to hold to the policy of "electric power as the crux, coal as the foundation". The scale of electric power construction in the Eighth 5-Year Plan must reach 100 million kW, of which new start-up operations will be 60 million kW, and new production will be 57 million kW. That is to say, per annum electric power will increase by 10 million kW. Such a pace would be highest in the world. The scale of construction for coal in the Eighth 5-Year plan would reach 280 million metric tons, of which newly opened operations would be 180 million tons, and new production would be 110 million metric tons. At the same time, there must be a further strengthening of prospecting and development of petroleum and natural gas, and nuclear energy construction must come into prominence.

Speaking of oil, Huang Yicheng frankly stated that because of insufficient capital the petroleum and natural gas industries are going to face an onerous task in the Eighth 5-Year Plan, and for the next 10 years. It won't be easy to see a net increase of oil (equivalent) of 23 million tons. For this reason, production in the East must be maintained, and in the West must be developed. Not only must production hold steady in the East, it must be increased in every possible way. At the same time, great efforts need to be made to explore and open up the West, with Xinjiang as the scene of the main battle; the degree of investment in geological prospecting must be strengthened, and a 5 to 10 million ton new oil region must be found during the Eighth 5-Year Plan. Oil and gas development off shore must be stepped up, and foreign cooperation in exploration and development must be continued.

The nuclear industry will also have an important role to play in the energy industry. Minister Huang said that the first and second phase construction at Qinshan must be speeded up, and the 600 megawatt nuclear unit must come on line soon. The first step in the construction of the Daya Bay and Liaoning nuclear power plants must be accomplished in the Eighth 5-Year Plan, so that they can move on to bigger steps.

For the next 10 years China's energy industry will be in a development period. It is a 'can do' proposition.

Minister Huang Yicheng expressed himself with complete confidence in saying that an enormous task lay ahead; to achieve secondary strategic objectives there must be a sense of urgency, a spirit of day and night struggle, and the courage and will to use every means to fight for the coal, electric, oil, and nuclear industries.

Energy Sector Trying To Transform Itself Into a Modern Industrial System

916B0018B Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 4 Oct 90 p 1

[Article by reporters Ding Yanfang [0002 3601 2455] and Li Gang [2621 6921]; "China's Energy Resource Industry Steadily Developing, Forming a Relatively Complete Modern Industrial System"]

[Text] After a glorious history covering 41 years, China's energy resource industry, which is closely related to our national economy and people's livelihood, has now formed a relatively complete modern industrial system. Total output of primary energy resources surpassed the landmark figure of 1 billion tons of standard coal, making China one of the world's energy resource powers.

Improvement and rectification during 1989 made it one of the fastest years of growth in coal and electric power production throughout China over the past decade. Raw coal output in China reached 1.054 billion tons in 1989, up 75 million tons over 1988 and one of the highest years in history. Power output was 584.8 billion kWh, up 7.3 percent over 1988. In a difficult situation of our main oil fields entering a moderate and high water content period, a great deal of work was done in petroleum and natural gas extraction which led to stability and some growth in oil output. The pace of the startup of nuclear power was rather quick and construction of the Qinshan and Daya Bay Nuclear Power Plants is now pushing forward. Their first generators will begin operating and generating power in 1991 and 1992, respectively. Overall development of energy resources has effectively guaranteed the needs of national economic development.

As we entered 1990 and are relying on S&T progress, the energy resource industry is striving to improve economic results. The overall energy resource production situation in China continues to be good. By the end of August 1990, total raw coal output was 685.28 million tons, 52.78 million tons over the plan and up by 4.81 percent

over the same period in 1989. National electric power output was also up 6.3 percent over the same period in 1989.

We have also made substantial achievements in the area of energy resource capital construction. During the first 2 years following the establishment of the Ministry of Energy Resources, for example, the coal production capacity going into operation was 33.04 million tons in 1988 and 25.52 million tons in 1989. Projections for 1990 are 25.00 million tons, so we may complete 83.29 million tons over 3 years. The new installed electric power generating capacity was 10,830MW in 1988 and 9,300MW in 1989, and in a situation of reduced state capital construction investments, it will be at least 9,000MW in 1990. The Ministry of Energy Resources proposed in 1988 that accelerated construction of energy resource projects be the breakthrough point in better utilization of energy resource capital construction investments. Many examples of shorter construction schedules and lower construction costs have appeared in coal and power construction now.

A correct guiding ideology was the main reason that the energy resource industry was able to make such achievements. On the one hand, we have gradually achieved a sustained rational proportional relationship between the rate of growth in energy resources and the rate of growth in the national economy, and on the other hand we have focused on opportunities to reduce the contradiction between energy resource supply and demand in readjustment of the national economy. We have done well in improvement and rectification within the energy resource industry, made a major effort to improve results and efficiency, and broadly undertaken technical innovation and technical transformation, which have led to sustained and stable development of the coal, electric power, petroleum, and nuclear industries. All enterprises are observing this train of thought and have directed the initiative and creativity of their employees toward internal improvement and exploiting potential. The results of the current "safe and civilized production and setting high levels activities" are apparent. At Jiangsu's Jianbi Power Plant, for example, the 1,625MW in installed generating capacity could only provide guaranteed output of 700 to 800MW in the past, but this has now been raised to 1,500MW.

Rapid Growth Reported in Electric Power Development

916B0036D Shanghai JIEFANG RIBAO in Chinese 15 Jan 91 p 3

[Text] China's electric power industry has grown through the years at a sustained rate of 8.4 percent. During the Seventh 5-Year Plan the speed of development of installed capacity and generation of electric power for the entire country was fastest in the world.

In 1985 the central authorities promoted the "electric power is the centerpiece of China's energy industry

"development" policy that was the catalyst for the expansion of China's electric power industry. According to the Ministry of Energy Resources, during the Seventh 5-Year Plan the electric power departments, inspired by this policy, opened up many financing channels, and adopted many measures for thermal, hydro, and nuclear power, which brought about an unprecedented scale of development in China's electric power industry. In 5 years, the total investment in national electric power was 96.4 billion yuan, installed capacity exceeded 46 million kW, and new increased output was 204.3 billion kWh. The average annual growth rate was 8.4 percent. This rate of growth was not only unprecedented for China, it was right up there with the major electric power countries, the U.S., Soviet Union, and Japan. Up to 1990 the total capacity of national power generating facilities reached 135 million kW, generating 615 billion kWh annually, fourth highest in the world.

The main emphasis of electric power construction in the Seventh 5-Year Plan was in large units and ultra-high voltage. By the end of 1990 there were 7,340 kilometers of 500,000 volt transmission lines nationwide, over 50 units of 300 megawatt and up went into operation, and with that, China's electric power industry had entered a period of large units, large plants, high voltage, and high automation. At the same time, China also imported foreign 1980s' advanced level 300 and 600 megawatt complete thermal power generator units, and by studying international class technology, the quality of China's large scale thermal units was improved. Now China's electric power facilities are keeping up with 1980s' international levels.

Experts say the high rate of development of China's electric power in the Seventh 5-Year Plan was intimately founded in the organizational reforms. The reform measures for collecting funds for electric power construction, and pushing investments into electric power through many levels and many channels were the impetus for rapid development of electric power. The amount of foreign capital used by the electric power industry in the Seventh 5-Year Plan is estimated to be equivalent to 10 billion yuan, and local funding and completed local projects amounted to 28.57 billion yuan, thus changing the pattern in past years of a total reliance on national investments for electric power construction.

Government Pledges 23 Billion Yuan for Coal, Power Projects

40100033 Beijing CHINA DAILY (Economics and Business) in English 4 Mar 91 p 2

[Article by staff reporter: "Energy Plan Gets State Fund"]

[Text] The central government has pledged 23 billion yuan (\$4.4 billion) for the construction of coal and power projects this year, in what is considered a significant move towards executing the nation's future development strategy.

According to officials at the State Energy Investment Company which implements central economic planning, this year China will fund the building of a total of 75 mine shafts with an annual output capacity of 112.12 million tons of coal and 75 power projects with a planned generating capacity of 32.83 million kilowatts.

The investment was arranged by the company under the supervision of the State Planning Commission.

The Eighth 5-Year Plan, which is under deliberation and will start this year, calls for major efforts to develop the nation's energy industry.

The blueprint stresses the construction and expansion of "a number of large and middle-sized power stations and coal mines." The plan pays special attention to the building of coal production bases in Shanxi, Shaanxi, Inner Mongolia and Ningxia and hydro and thermal power stations.

China plans to increase its coal output to 1.23 billion tons and power output to 810 billion kilowatts by the year 1995.

The investment plan this year will create 41 new mine shafts with an annual output capacity of 79.7 million tons, and begin work on 34 coal shaft renovation projects with an annual capacity of 32.42 million tons, and 18 coal-washing plants with an annual capacity of 52.4 million tons.

Of these projects, 23 mine shafts and 9 coal-washing plants will be completed this year.

The cost of the coal projects is estimated at 8.1 billion yuan while the cost of the power projects is estimated at 14.8 billion yuan.

The money used will not include funds raised from issuing bonds, the corporation officials said.

They said the State investment would account for 85 percent of the funds required for the coal projects and 55 percent of the funds needed for the power projects.

The power projects started this year will cover Shuikou, Yantan, Manwan, Geheyuan, and 23 other large hydroelectric power stations with an installed capacity of 14.47 million kilowatts. Construction will also start on 52 thermal power plants this year, including Wujing, Beilungang, Pingyu, Jiangyou and Weihe with a total installed capacity of 18.16 million kilowatts. The State also plans to pump funds into 218 power transmission and transformer projects this year.

Corporation officials expect that the building of 20 power generating units of 3.29 million kilowatts and 3,521 kilometers of power lines will be completed this year.

The corporation has urged project contractors across the country to tighten control of their construction budgets.

"They've been told to carefully design, work and strictly control their budgets," the corporation officials said.

The contractors are required to lower production costs, reduce waste and shorten the construction period. They are prohibited from working on construction projects that are not part of the State plan, the officials said.

Henan: China's New Energy Base

916B0018A Beijing LIAOWANG ZHOUKAN
[OUTLOOK WEEKLY] in Chinese 19 Nov 90 pp 12-13

[Article by Yang Yinglan [2799 5391 5695] and Liu Yaming [0491 7161 7686]: "China's New Energy Resource Base Area—Henan"]

[Text] Henan Province is becoming a big energy resource province which produces 1 ton of coal, 0.1 ton of crude oil, and 370 kWh of electric power per capita annually. This would have been unthinkable a few years ago. People have the impression that Henan's vast expanse of fertile land on the central plain is a simple scene of fields. Today, lying before everyone are row upon row of modernized large-scale mining regions stretching for 100 li rising up from the earth, train after train loaded with coal speeding to the south and east, and crude oil and natural gas flowing along pipes in all directions. An energy resource industry composed mainly of coal, petroleum, natural gas, and electric power now occupies an important position in economic construction in Henan and is playing a major role in China's four modernizations drive.

Henan produced 88.58 million tons of raw coal in 1989. It has been China's second biggest coal producing province for the past decade. It produced 10,000 tons of crude oil, fourth place in China, and 1.3 billion cubic meters of natural gas, making it China's second largest natural gas production base area second only to Sichuan. Electric power output surpassed 30 billion kWh for the first time, accounting for one-third of the Central China Grid.

I. New Vitality for a Golden Sea of Coal

Henan is rather rich in energy resources. It has 19.56 billion tons of coal reserves, over 600 million tons of proven petroleum reserves, and more than 100 billion cubic meters of natural gas and associated gas. Moreover, it is located in the central plain and is connected with all regions. It is said that "all of China can be reached through the central plain". Railroad trunklines including the Jing-Guang [Beijing-Guangzhou], Long-Hai [Lianyungang-Lanzhou], Jiao-Zhi [Jiaozuo-Zhicheng], Xin-He [Xinxiang-Heze], and others connect with the primary coal producing regions at Zhengzhou, Luoyang, Xinxiang, and Jiaozuo and are playing a role from east to west in state energy resource construction. Since the beginning of the 1980's, the state and Henan Province have placed a strategic focus on developing the energy resource industry. There are 61 key projects for new construction, expansion, and transformation of coal

mines, petroleum, electric power, and so on at a total investment of 13.2 billion yuan. They are now going into operation and are forming a substantial scale in Henan's energy resource industry. Henan Province's total value of output in the energy resource industry is now 5.6 billion yuan, equal to 11.8 percent of the total value of industrial output in Henan.

Henan is one of the regions where the Chinese nationality emerged and it has a history covering more than 2,000 years in developing and using coal. Chinese archaeologists have confirmed from the relics of iron smelting at Tieshenggou in Henan's Gongxian County that as early as the Western Han era, Henan coal was the main fuel for smelting iron and in the Song era, Henan's coal production attained the spectacular situation of "a million households in the ancient capital Kaifeng using coal, not a single family burning straw".

In the 41 years since New China was founded, raw coal output in Henan has grown at an 11 percent annual rate. Now, 6 days' output exceeds total yearly output during 1949. Especially since reform and opening up, there is glowing vitality in Henan's coal industry and it has moved up to successive new stages. Since surpassing 60 million tons in annual output in 1983, it has grown by an average of 4.5 million tons yearly.

There are now 75 coal producing counties and cities altogether in the 21,000 square kilometer coal-bearing region of the central plain, including 16 counties and cities which have been listed as key national coal producing counties and prefectures that form five big coal production base areas at Pingdingshan, Yima, Jiaozuo, Hebi, and Zhengzhou. There are nearly 40 large and medium-sized mineshafts with a yearly production capacity of more than 600,000 tons in Henan. Pingdingshan City, known as the "coal bunker of the central plain" has become a modern comprehensively developed coal city. New construction and expansion of the Pingdingshan Mining Bureau's No 1 Mine and No 8 Mine have turned them into huge mineshafts with a design capacity of 3 million tons, among the largest in China. Total raw coal output in Pingdingshan City in 1989 was 32 million tons, making it the largest coal production base south of the Huang He in China.

Henan has also reinforced local railroad construction. Local railroads extending to the Jing-Guang [Beijing-Guangzhou], Long-Hai [Lianyungang-Lanzhou], and other railway trunk lines have reached 1,600 kilometers, first place in China, and a substantial portion of them serve the out-shipment of coal. Over the past 40 years, Henan Province has supplied the state with a total of 1.52 billion tons of raw coal. It has shipped out 20 million tons of raw coal a year for the past several years to Hunan, Hubei, and Guangzhou to the south, Nanjing and Shanghai to the east, and Beijing, Tianjin, and Liaoning to the north. It has supported construction in 16 provinces and municipalities and reduced the energy resource shortage in industrial regions along the coast of east China.

II. A Big Network of "Hydropower in the South and Thermal Power in the North"

Henan's electric power industry has made full use of its coal production advantages and favorable conditions of lying near the Shanxi coal base area and has grown rapidly over the past few years.

Henan has built and expanded more than 10 medium-sized thermal power plants including Yaomeng, Jiaozuo, Xinxiang, and others along coal mine pit mouths and railway intersections with an installed generating capacity of 4,320MW, including an installed generating capacity of 1,200MW at Yaomeng Power Plant, one of China's biggest thermal power plants. Five more large and medium-sized power plants are under construction. Henan has more than 100 power plants of 5MW and larger which generate more than 4,000 times the amount of power in the early 1950's. Especially noteworthy is 1985 to 1989, when an average of 436MW in installed generating capacity was placed into operation each year for an average annual growth rate of 8 percent. This was the best period in the development of Henan's electric power industry.

Besides building power plants, power transmission lines as dense as spiderwebs extend to all corners of Henan and it has built China's first 500 kV power transmission line that links Henan with Hubei, Hunan, and Jiangxi to form a large grid, the Central China Power Grid, that has been matched up with Gezhouba Hydropower Station to form a power source configuration of "hydropower in the south and thermal power in the north" to achieve regulation of hydropower and thermal power across provincial and regional boundaries. This has helped transmit hydropower from Gezhouba to Shanghai and linked the Central China Grid with the East China Grid to achieve the first integration of large grids in China.

Under the impetus of reform and opening up, Henan has adopted a policy of "those who invest being those who use power and benefit" to develop its electric power industry. Besides some state investments, it has also relied on raising capital from many parties to develop electric power. Henan has raised 6.3 billion yuan in investments to develop power so far and 3 billion yuan in capital has already been or will be invested. It has built or expanded five large and medium-sized power plants with an installed generating capacity of 1,160MW, including Xinxiang Thermal Power Plant which was expanded entirely through 500 million yuan in capital raised by Henan and Xinxiang City. It has two 200MW generators and will be completed and go into operation within a year. Henan has raised 2 billion yuan to develop local small-scale thermal power and increased the local small-scale thermal power installed generating capacity to 1,250MW, which has effectively improved the industrial and agricultural power shortage situation in some counties, townships, and villages. The number of peasant households supplied with electricity in Henan has grown at an average annual rate of 4 percent and 60.5 percent of its peasant households are now supplied with electricity.

III. Major Achievements in Scientific and Technical Progress

The petroleum and natural gas industries in Henan only began making great strides in the 1970's but the pace has been rapid. The Zhongyuan [Central Plain] and Henan Oil Fields have now been completed in northern and southern Henan and are known as two pearls on the vast central plain.

Zhongyuan Oil Field has relied on S&T progress to accelerate the pace of development. While relying mainly on technical forces inside China to develop cooperative attacks on key technical problems, seeking the strengths of the masses, and transplanting the "technical advantages" of all of China's oil fields, they have also opened up to the outside world, imported foreign capital and advanced technology and equipment, and hired foreign technical service teams. Since 1983, the oil field has invited over 200 experts and professors from 51 scientific research units, institutions of higher education, and plant and mine enterprises from throughout China to undertake scientific research with scientific research personnel at the oil field, and it has established long-term contractual relationships and signed over 80 S&T contracts with over 30 scientific research units and institutions of higher education. It has also signed 152 economic contracts with foreign countries and invited more than 6,000 technical personnel from over 20 relevant state companies to come to the oil field for technical exchanges, lecturing, and services. Through cooperative attacks on key problems, the oil field has continually improved its drilling techniques and drilled several directional wells, clustered wells, super-deep wells, and zero wells which involved considerable technical difficulty. They show that China's petroleum industry has moved from relying on experience in drilling wells to a new stage of scientific drilling. Since 1986, the speed of oil field well drilling has risen at an annual rate of 18.7 percent and costs have declined 5.3 percent, attaining advanced international levels. Since 1983, they have imported seismic prospecting, well logging, mud, and other new technologies as well as 4,800 pieces and sets of advanced equipment from the United States, France, Germany, and other countries which are now playing a role in oil field production. After several years of efforts, the oil field has now grasped and applied several relatively advanced technologies in comprehensive geological research, seismic prospecting, drilling, mud, and other areas and some have attained international levels of the late 1970's and early 1980's.

Now, over 1,200 wells at the Zhongyuan and Henan Oil Fields are continually using a dense deployment of underground pipelines to transmit the blood of industry to the central plain, north China, east China, and other regions to support the four modernizations drive. Henan Province is using crude oil and natural gas to build several large and medium-sized petrochemical industry enterprises which are playing a role in local industrial and agricultural construction. Luoyang Oil Refinery has

completed a yearly processing scale of 5 million tons of crude oil and has now formed an oil refining capacity of 3 million tons and has a yearly output value in excess of 700 million yuan. A plant near Luoyang Oil Refinery to

produced 55,000 tons of polypropylene has now begun operation and many residents in Zhengzhou, the site of the Henan Provincial CPC Committee, are using natural gas.

Yunnan-Guizhou Cooperation in Hydropower Development

*916B0031D Guiyang GUIZHOU RIBAO in Chinese
17 Nov 90 p 1*

[Article by Gu Rongtai [7357 2837 3141], and Bao Suijin [0545 4378 6930]]

[Excerpt] Qujing Prefecture, Yunnan Province, and Lupanshui City, Guizhou Province, founded on common resources and equal benefits, and in accord with the principles of reciprocal investment, risk, and shared returns, will jointly develop the Xiangshui hydropower station. The opening period of this exercise has already reached a substantive stage. From 29 October to 1 November, at Xuanwei Yunnan, relevant ministries and commissions, planning, construction, and hydropower leaders and experts from Yunnan and Guizhou entered into a serious investigation of the initial design of the power station. The experts gave high praise, and approved the preliminary design jointly worked out by the Guizhou Province Water Resources and Electric Power Survey and Design Academy, and the Yunnan Province Qujing Prefecture Water Resources and Electric Power Academy.

The Xiangshui power station is located on the border river section of the upper Beipan Jiang between Xuanwei, Yunnan, and Shuicheng, Guizhou. It will be the 6th cascade of a series of stations on the Beipan Jiang, 192 kilometers from Xuanwei, and 89 kilometers from Lupanshui City. In the preliminary design, the Xianshui station will be a medium-scale plant with two 50,000 kW generator units, and will have an annual average output of 602 million kWh. It is estimated the total investment will be 197 million yuan. [passage omitted]

Hydropower Development of the Qing Jiang Drainage Basin

916B0046A Beijing RENMIN RIBAO HAIWAI BAN in Chinese 30 Jan 91 p 1

[Article by reporter Lang Xinhui [6745 2450 6540]]

[Text] China is stepping up hydroelectric development of the Qing Jiang drainage basin. The Qing Jiang begins at Lichuan, Hubei Province, and is the first large tributary at Sanxia on the Yangtze. Its total length is 423 kilometers. Studies have found that the volume of runoff from the Qing Jiang watershed reaches 140 millimeters per year, the average fall per kilometer along the 270-kilometer stretch of the main course is over 4 meters, and its capacity of hydroelectric resources is 2.9 million kW, making it an ideal watershed for exploitation.

As planned, the entire main course of the Qing Jiang will be divided into two segments. The upper segment will be developed in nine stages. Three cascade power stations will be built on the lower segment for a total installed capacity of more than 2.89 million kW. It is estimated they will be generating power by 1993.

The construction at the Qing Jiang key development project, Geheyuan, is being stepped up. When this large hydropower plant is completed, its installed capacity will be 1.2 million kW.

According to an authority of the Hubei Province Qing Jiang Development Corporation developing the Qing Jiang will bring huge profits and social benefits. After three phases of development, the Qing Jiang's annual power output will approach nearly 10 billion kWh—virtually another Gezhouba—and that will greatly alleviate the tight consumption situation in the central China region.

Accelerating Development on Upper Reaches of the Huang He

*916B0031A Xining QINGHAI RIBAO in Chinese
14 Dec 90 p 1*

[Article by reporter Niu Shumin [3662 3219 2404]]

[Excerpts] In order to step up the pace of hydroelectric development on the upper reaches of the Huang He, The Ministry of Energy Resources recently signed an agreement in principle with the provinces of Shaanxi, Gansu, and Qinghai, and the Ningxia Hui Autonomous Region for a joint venture to construct the Lijiaxia hydroelectric station.

The agreement was signed on 6 December at Xi'an by the Deputy Minister of the Ministry of Energy Resources, Shi Dazhen [0670 1129 2823], Deputy Director of the National Energy Investment Corporation, Yao Zhenyan [1202 2182 3508], Vice Governor of Shaanxi Province, Liu Chunmao [0491 2504 5399], Vice Governor of Gansu Province, Li Ping [2621 5493], Vice Governor of Qinghai Province, Wu Chengzhi [0702 2110 1807], and Vice Chairman of the Ningxia Hui Autonomous Region, Ren Qinxing [0117 0796 5281].

The Lijiaxia hydroelectric station on the upper Huang He is a large hydroelectric station project begun in 1987 following completion of the Longyanxia hydroelectric station. It will have a total installed capacity of 2 million kW, an average annual power output of 5.9 billion kWh. It will have superior technical economic indicators, high economic efficiency, and will benefit society. The total investments for station construction and transmission engineering are 3 billion yuan. [passage omitted]. In order to speed up construction and to satisfy the pressing commitments of the Ninth 5-Year Plan for the northwest electric power network, the various parties held talks and collectively decided that the Lijiaxia hydroelectric station would be a national/four-province (region) joint venture project. [passage omitted]

By local agreement, in 1991, concurrent with national investments, Shaanxi, Gansu, Qinghai, and Ningxia will collectively raise 50 million yuan to guarantee that the Lijiaxia hydroelectric station will flow within the year. It

is hoped that a formal agreement on the joint venture construction of Lijiaxia station will be formally signed in February or March 1991.

More Medium-Sized Stations Could Be Built on Upper Huang He

916B0046B *Lanzhou GANSU RIBAO* in Chinese
2 Jan 91 p 1

[Article by reporter Chen Yuheng [7115 3768 1854]]

[Text] Ten medium-sized hydroelectric plants with a total installed capacity of 1.54 million kW, and an annual output of 7 billion kWh have been added to the plan to develop the Longyangxia-Qingtongxia segment of the Huang He.

The Longyangxia to Qingtongxia segment of the Huang He traverses Qinghai, Gansu, and Ningxia Autonomous Region, a total of 1,023 kilometers, and has a total fall of 1,465 meters. The original program envisioned 15 large and medium-sized hydroelectric plants for a total installed capacity of 14.224 million kW, and an annual output of 50 billion kWh. That will be increased by ten medium-sized stations, three within Gansu at Tahejia, Hekou, and Chaijiaxia. The majority of the plants will be situated upstream and downstream from the large plants. Not only will the area lost to inundation be small, and the technology simple, but the reduction of engineering scale from large to medium will save investments, reduce costs, and shorten construction time. According to initial estimates, the investment level will be about 2,500 yuan per kW for the ten plants.

Manwan Update

916B0046D *Beijing RENMIN RIBAO HAIWAI BAN*
in Chinese 6 Dec 90 p 1

[Article by reporter Liang Shutang [2733 2885 2768]]

[Text] The Manwan hydroelectric power plant is a national key project located in what is known as the "four dragon's water contrivancy". The four hydroelectric power bureaus that are in close cooperation on this project have gotten off to a smooth start on the Daba concrete structure.

The Manwan hydroelectric plant, located on the middle reaches of the Lancang River in Yunnan Province, will have an installed capacity of 1.5 million kW. This large scale hydropower plant is distinguished among national hydropower plants now under construction by being undertaken with two major innovations; one, it is being built totally with provincial funds; two, bids are being let for each of its construction items, and the job will go to the best applicant.

The overall implementation of the bidding has had a positive effect on the various engineering units, and because they are making the most of their specific strengths, the construction of the power plant is moving

along smoothly. With the cooperation of the Japanese Dacheng [1129 2052] Corporation, the Hydroelectric Plant 14th Bureau has accomplished the world's best tunneling footage in completing the No 1 diversion tunnel on schedule, and in working closely with the Hydroelectric No 3 Bureau, has completed the main stream diversion ahead of schedule. In accordance with the prevailing situation, all of the construction units are coordinated under the authority of the Manwan Hydroelectric Engineering Control Bureau. By the end of January of this year, 450,000 square meters of the concrete structure for the Manwan hydroelectric power plant had already been completed.

Much of Work on Longyangxia Now Completed

916B0046C *Xining QINGHAI RIBAO* in Chinese
6 Dec 90 p 1

[Article by reporter Xu Weihua [1776 5898 5478]]

[Excerpt] A key engineering project of the Sixth and Seventh 5-Year Plans, the Longyangxia hydroelectric station, after more than 7 years of construction, is now basically completed and hooked up to the northwest power network. It is a major energy resource for industrial and agricultural production and the people's livelihood in Qinghai and the northwest region (Xinjiang excluded).

The Longyang project includes Long(yangxia)-Hai(shiwan), Long(yangxia)-Huang(jiazhai) and Hua(yuan)-Huang(jiazhai), altogether 50 lines of 330,000 volt extra-high voltage transmission lines for a total length of 801.3 kilometers. Except for the three-phase Longhai line now being checked for acceptance, the other lines have been completed and put into production. The Longyangxia station's output of more than 12 billion kWh will greatly enrich the economy and the society. [passage omitted]

Possibility of Adding More Stations Between Longyanxia, Lijiaxia

916B0031B *Xining QINGHAI RIBAO* in Chinese
17 Dec 90 p 1

[Article by special correspondent Chen Yuheng [7115 3768 1854]]

[Text] The Northwest Survey and Design Academy of the Ministry of Water Conservancy and Electric Power has completed its report on (Survey for Medium Power Stations on the segment of the Huang He between Longyangxia and Liujiashia). The report proposes a proper cascade exploitation of the segment between Longyangxia and Liujiashia, using the low water-head flow-through pattern. With this addition, the original plan can be increased by seven medium stations for a total installed capacity of 1.23 million kW, and an annual production volume of 5.145 billion kWh.

This idea is based on the fact that between each of the six cascade power stations in the original plan, there are drops of more than 40 meters that are not being fully utilized. The academy conducted more than two years of surveys, analysis, and research of selected points, and proposes that between the stations at Xiwa, Lijaxia, Gongbaixia, and Jishixia, seven medium stations be constructed at Nina, Shaping, Zhiganglaka, Kangyang, Suzhi, Huangfeng, and Dahejia. This will increase the utilization of this stretch of the river to 93 percent. A supplementary plan has already been drawn up for the Laxiwa to Lijaxia segment, and a feasibility study of the Nina hydroelectric station has already been reported and reviewed.

The development pattern of letting the big bring along the small can be employed for these medium stations, and their technical economic indicators are outstanding. Initial estimates indicate that the average investment per kW will be about 2,500 yuan, and the time from beginning of construction to starting up the first generator will be 3 years.

Hubei Making Progress in Hydropower Development, Rural Electrification

916B0031C Wuhan HUBEI RIBAO in Chinese
13 Dec 90 p 1

[Article by correspondent Wang Chaoying [3076 6389 5391]]

[Text] The organization system reforms of the Seventh 5-Year Plan have opened up channels for raising capital for managing electric power. Hubei's electric power construction has advanced from unilateral management into a multilateral management stage. Throughout the period more than 1 billion yuan have been invested, and the Heyan hydropower station, and the Hanchuan power plant have been separately undertaken in joint ventures with the central government. The first unit of the Hanchuan plant is already operating, and it has become the highest capacity single-unit generator in Hubei. By using self-raised funds, the conversion of the Jingmen thermal power plant from oil to coal, and the first batch of the "short, even, and fast" expansion projects, the Shashi, Qingshan, and Wuchang power plants, have all been

completed. Local, enterprise, collective, and individually managed power projects have been very active, and all across the province nearly 400 power plants of 500 kW and up have been constructed, for a total capacity of more than 6.7 million kW, an increase of 54.7 percent compared with 1985. It is estimated that the annual power produced by the end of the year may reach 33.4 billion kWh, an increase of 53.3 percent. As the world renowned Gezhouba hydroelectric station went into full scale operations, Hubei's installed capacity and hydropower volume jumped into first place in the country.

Directing efforts against the weaknesses, the fact that the main power resources and supply are in western Hubei, and the power demands are in eastern Hubei, that transmission distances are long, line loss is great, and the current unsteady, Hubei was able to make improvements during the Seventh 5-Year Plan in its power network structure. Since constructing China's first 500,000 volt high voltage line, Hubei has, during the Seventh 5-Year Plan, constructed the nation's largest network consisting of seven 500,000 volt high voltage alternating current lines, and one 500,000 volt direct current line crossing over the province. At the same time three 220 KV lines were constructed in western, northwestern, and eastern Hubei, providing for the first time, 220 KV power networks down to the prefectures, 110 KV power down to the counties; all united in one provincial network. Serving as the hub of the central China power network, the Hubei power network will become ever more vital.

During the Seventh 5-Year Plan electric power for public consumption throughout the province has grown. It is estimated that by this year's end it will increase to 29 billion kWh, a 50.85 percent increase over 1985. The peak load consumption has reached 4.29 million kW, an increase of 50.5 percent, of which the average used for agricultural, and for residential use in cities and towns during the Seventh 5-Year Plan increased 11.5 and 19.7 percent, respectively. Now, throughout the province, 98.2 percent of the towns, 92.3 percent of the villages, and 85.7 percent of rural homes are hooked up to power lines, exceeding the average level for all of the country. Power network switching, automated telecommunications, power supply volumes, and reliability are continuing to increase.

Huangpu Oil-to-Coal Conversion Project Completed

916B0042D *Guangzhou NANFANG RIBAO* in Chinese
16 Dec 90 p 1

[Article by reporter He Shengzu [0149 4939 4371]]

[Text] The conversion of the Huangpu Power Plant from oil to coal has been completed. The plant's original total installed capacity of 500,000 kW has been increased to 1.1 million kW, doubling its generating capacity, and making it the largest thermoelectric power plant in Guangdong Province.

The oil-to-coal conversion of the Huangpu plant, a key project in Guangdong's Seventh 5-Year Plan, was funded with a loan from the State Council Oil-to-Coal Conversion Corporation, and with capital collected by the Province. The project was formally begun on 28 February 1986. Two 300,000 kW Chinese-made coal-fired electric power generators, and a 2.2-kilometer coal viaduct outside of the plant were installed for this project. A storage yard was built to hold a 20-year accumulation of coal ash from the two units, as well as the corresponding ash conveyer system.

The project's first unit, the No 5 generator unit, was completed and went on line on 5 December, and after its initial shakedown, the second unit, No 6, went into production.

Daba's First Unit Officially Joins Grid

916B0042A *Yinchuan NINGXIA RIBAO* in Chinese
25 Jan 91 p 1

[Article by reporters Zhao Jingquan [6392 2529 3123], and Yu Xiaolong [0060 1420 7893]]

[Excerpt] The No. 1 unit of the Ningxia Daba Power Plant began operating on 24 January. This is the first 300,000 kW thermoelectric generator in the northwest. The project took 32 months from start of construction to entering the grid, and was completed 4 months ahead of schedule. The unit will generate 1.8 billion kWh per year, supplying power to the autonomous region.

The planned ultimate capacity of the Daba plant to be built in three phases, is 2.4 billion kW. In the first phase, two single units of 300,000 kW capacity each will be financed by the National Energy Resources Corporation, and the Autonomous Region People's Government. In 1989 it was listed as a key national project, and in 1990 it was again listed among the 20 national key "large and medium-scale projects" under construction. This engineering project formally got underway on 18 April 1988, and proceeded directly through every sort of difficulty, among which was a serious lack of capital, which caused late delivery of material and a shortage of steel. [passages omitted]

Fengzhen's No 2 Unit Now Operational

916B0042B *Hohhot NEIMENGGU RIBAO* in Chinese
29 Dec 90 p 1

[Article by reporter Li Shuxiu [2621 3219 4423]]

[Excerpts] The 200,000 kW No 2 unit, for the first phase of construction of the Fengzhen power plant, a national key construction project, has been completed. It joined the grid on 10 November, after 72-hour and 24-hour test runs. [passage omitted]

With support from the higher authorities and participating parties, the builders overcame many difficulties, kept construction going, and put the first unit on line on 21 November of last year. After 1 year of operations, the economic indicators were high compared with similar units around the country in their initial period of operation. The addition of the No 2 unit boosts the power plant's installed capacity to 400,000 kW, and joins a trend in the region's western network toward large units, large plants, large grids, and "high voltage, high parameters, and high automation levels", and opens up a new road for the Nei Monggol power industry. Since construction of the Fengzhen power plant began on 1 July 1986, the total investment has been 650 million yuan. As the No 2 unit goes into production, it will fulfill the requirements of the Nei Monggol Party Committee and Government's Seventh 5-Year Plan for installation of two 200,000 kW units at the Fengzhen power plant, and realize Nei Monggol's Seventh 5-Year Plan target for installed capacity.

Construction Update on Shihezi Cogeneration Plant

916B0042C *Urumqi XINJIANG RIBAO* in Chinese
30 Oct 90 p 1

[Article by reporter Wei Feng [7279 1526]]

[Excerpts] Preparation for the construction of Xinjiang's 2nd Regional Power Plant, Shihezi East heat and power plant, began in mid-October.

After construction of this heat and power plant, which will cover 11,000 square meters, and have a total installed capacity of four 12,000 kW (units), it will solve the central heat supply problem for Shihezi, and it will greatly ease the imbalance of electric power supply to the Shihezi area.

In recent years, as industry and agriculture developed, and the standard of living continued to rise, the power load and consumption in the Shihezi area increased by 11.4 percent, and 11.1 percent, respectively, each year. In winter and spring only one-third of the needed supply is available. The shortage of power seriously affects the people's livelihood, and results in industrial and agricultural production value losses of more than 200 million yuan. [passage omitted]

THERMAL POWER

JPRS-CEN-91-004
22 March 1991

This heat and power plant will generate 140 million kWh, and supply 900,000 square meters of home heating, or 93 percent of heated space in the Shihezi eastern area.

Work on Dalad Plant About to Begin

*916B0042E Hohhot NEIMENGGU RIBAO in Chinese
26 Dec 90 p 1*

[Article by reporters Wang Zepu [3768 3419 2528], and Zhang Gang [1728 0474]]

[Text] The State Planning Commission has officially responded to the proposal for the Dalad power plant

project, a well appointed, large-scale 5 million kW power plant, and its construction is about to begin.

The official response stipulated that the scale of this phase of the construction would be 600 megawatts, or two 300 megawatt coal burning power units. The total investment for this phase will be 900 million yuan, and for the accompanying power transmission structure it will be 180 million yuan. The National Energy Resources Investment Corporation, and the Nei Monggol Autonomous Region will each contribute 50 percent. This phase of the project will require 1.5 million tons of coal; the Dongsheng coal mine is under consideration as the supplier, and rail shipment of coal to the plant is assured.

Coal Target for Year 2000: 1.4 Billion Tons

40100034 Beijing CHINA DAILY (*Economics and Business*) in English 8 Mar 91 p 2

[Text] The nation's coal mines reaffirmed their commitment on Tuesday to supplying enough fuel for the nation to continue its economic growth up to the year 2000.

The message came from an annual national conference on the coal industry at which the industry's development strategy is being reviewed.

"The coal industry will strive to meet the production target in order to implement the nation's modernization programme," said Hu Fuguo, president of the China National Coal Corporation, one of the industry's two State-run mining groups.

The industry is required to boost its annual coal output to 1.4 billion tons by the year 2000 from 1.09 billion last year.

Hu said the focus of the industry's future will remain the development of the area centered in Shanxi. The region, which includes the whole of Shanxi Province and the area where the northern tip of neighbouring Shaanxi Province meets the western edge of Inner Mongolia, boasts 60 percent of the country's proven coal deposits.

The government expects the region to turn out 500 to 600 million tons of coal in the year 2000, or 36 to 42 percent of the total official target.

The concentration will be on developing large mines. Some new mines are under construction and some old coal fields are being expanded.

So far 80 percent of the region's output is transported to other provinces. Experts estimate that the region should be able to supply 380 to 400 million tons of coal to the provinces a year by the end of the century.

To guarantee the increased coal supply, Hu called for railway transport to be improved "substantially."

Experts say around 350 million tons of coal, or 90 percent of the coal coming out of the region every year, will be transported by rail. They predict that 56 million tons will go to the three provinces in Northeast China, 153 million tons to East China and 8 million tons to Sichuan in Southwest China.

But in order to "reduce pressures on transport," Hu said that heavily-industrialized provinces in East and Northeast China should also try to increase coal output.

Conservation Stressed to Ease Supply-Demand Imbalance in 1991

916B0033B Shanghai JIEFANG RIBAO in Chinese 26 Dec 90 p 5

[Article by reporter Shi Zhixing [2457 1807 5281]]

[Text] According to information received from the China Coal Products Ordering Conference, next year's total coal resources can meet the needs of industrial and agricultural production, but at the same time it is evident that coal from the west can't be shipped out, and eastern coal can be shipped, but the volume is limited. Therefore, next year coal must be rationed to local customers in order to relieve the transportation bottlenecks.

The national economy has passed another year of adjustment, and basically controlled a spate of commodity price inflation and a slide in industrial activity at year's end. After March, the economy moved toward steady growth and gradual development of basic industries, especially the energy industry. It is forecasted that national coal production could approach 1.1 billion tons, electric power could increase 6 percent, and crude oil may exceed planned quotas. Next year, as authorities view it, the general economic effort will be to drive forth a policy of "sustain, stabilize, coordinate", and move away from economic efforts bent on speed alone, toward maintaining an effective moderation in development. In order to better develop the economy, next year's plans are to maintain a measured rate of increase, and there are many favorable conditions for next year's economic activity: national coal stocks compared with the same period last year will increase by about 50 million tons, with dissimilar rates of increase of stores of coal for the various industries and businesses. Coal moved on the market has increased by 40 million metric tons, and almost 10 million kW of electric generator units has been newly installed. In addition, stocks of raw materials, steel, cement, and other important commodities, so lacking for many years, have all increased in varying degrees, and are ready for next year's production, setting favorable conditions for next year.

Next year's economic activity still faces serious challenges. At present, the market has not yet completely been restored, there is pressure for products, capital is tight, and particularly, the downward slide in enterprise profits has not been contained, and the national financial situation is in some difficulty. Looking at energy, this year's coal stocks are fairly large, current production capability and requirements are basically compatible, and there are comparatively sufficient resources; but, energy allocations are a big problem, mainly evidenced in the imbalance between coal-producing areas and coal-consuming areas. Places in the east that urgently need coal include Anhui, Jiangsu, Jiangxi, Liaoning, and Hebei where the coal production level is diminishing each year, but in the west where the coal production potential is great, such as Shanxi, Shaanxi, and Ningxia, that production capacity cannot be made fully available because of limited transportation.

Next year's crude oil production will basically be maintained at this year's level, but demands will increase 5 to 6 million tons. Each year there are numerous chemical industry installations coming on line, and crude oil for that purpose must be assured, so there will be a fixed rate of increase in commercial production of oil. According

to initial calculations, more than 23 million tons of oil will be used each year for electric power. Because of the unstable situation in the Middle East, international oil prices are rising dramatically, and because of those price increases foreign oil will not be purchased as originally planned; oil stocks will be used instead, and that will cause a marked reduction in China's oil stocks. There is now a shortage of diesel oil all across the country, and most recently a full investigation into the question of diesel powered generators was done to determine next year's oil supplies. Measures will be taken to set maximum limits on use of oil, to get out of the oil squeeze, and manage oil requirements for the people's economy. Next year's only hope will be to emphasize savings of crude oil, and cut down on the high rate of consumption and impractical utilization of oil.

Outlook for China's Coal Dressing Sector

916B0037 Beijing MEITAN KEXUE JISHU [COAL SCIENCE AND TECHNOLOGY] in Chinese No 12, Dec 90 pp 8-14

[Article by Yu Ertie [0060 1422 6993] of the Northeast Inner Mongolia Joint Coal Industry Company: "Development Prospects for China's Coal Dressing Industry"]

[Text]

I. Forty Years of Achievements

Energy resources are a primary pillar of the national economy, and coal accounts for 73 percent of China's energy resource structure. Development of dressing and processing are an essential route for effectively utilizing our coal resources.

For the past 40 years, as China's economy has developed, the coal dressing industry has continually grown. By the end of 1989, we had 177 coal dressing plants with a total capacity of 181 million tons (Table 1). Our coal dressing capacity holds third place in the world, preceded only by the United States and Soviet Union, so we have become one of the world's leading powers in coal dressing.

Table 1. Number of Coal Dressing Plants Over the Years

Year	Total number of coal dressing plants	Coking coal dressing plants	Power coal dressing plants
1949	10	7	3
1955	14	10	4
1960	53	45	8
1965	60	49	11
1970	82	64	18
1975	96	75	21
1980	107	82	25
1985	130	92	38
1989	177	99	78
	(181Mt/a)	(123Mt/a)	(58Mt/a)

The main indicators of developments in coal dressing over the past 40 years are:

1. Completion of several large coal dressing plants, formation of a sizeable coal dressing capacity. We cooperated with the Soviet Union and Poland during the 1950's to build the Shuangyashan, Matou, Taiyuan, Zhuzhou, and other large coal dressing plants. In the late 1950's, we also attacked construction of several simple coal dressing plants (63 actually went into production at 18.18 million tons/year). Some of the plants underwent several transformations and took on a multitude of production tasks, such as the Chengzihe and Xiaohengshan plants at Jixi, both of which wash over 2 million tons a year. During the 1960's, China did its own designing and construction of several large coal dressing plants like Pingdingshan Tianzhuang (3.5 million tons/year), Huabei Qinglongshan (2 million tons/year), Shuicheng Wangjiazhai (1.5 million tons/year), Dukou Baguanhe (1.8 million tons/year), Shitanjing Dawukou (3 million tons/year), and others. From the late 1970's to the 1980's, while relying on domestic forces to build several new plants, we also imported foreign technology and built several large modern plants at Fangezhuang, Qianjiaying, Xinglongzhuang, Xiqu, and so on. The Pingshuo Antaibao Coal Dressing Plant built through joint investments by China and the United States has a capacity of 15 million tons/year. China now has coal dressing plants which can dress bituminous coal as well as coal dressing plants which process anthracite and lignite. While building new plants, we also expanded several older plants. This pushed China's coal dressing capacity up into advanced world ranks. Table 2 shows the amount of coal washed in the world's main coal producing nations.

Table 2. Amount of Coal Washed in World's Main Coal Producing Nations

Country	Output (million tons)	Amount washed (million tons)	Proportion washed (percent)
United States	803.85	337.62	42
Soviet Union	726.00	311.33	42.9
China	872.28	142.94	16.4
Poland	249.38	122.20	49
Australia	175.50	133.38	76
England	91.88	91.88	100

2. Increased proportion processed, improved product mix. The proportion washed in unified distribution coal mines is 39 percent. Added to the rapid development of screening over the past few years, the proportion processed has reached 95 percent. This has changed the single product structure in the past that was dominated by direct sales of raw coal and formed a multi-product mix of clean coal, sized coal, powdered coal, and so on and promoted rational utilization of coal.

3. In a situation of degrading raw coal quality, the quality of commodity coal has risen every year. With the development of mechanized tunneling and extraction of low quality coal seams, the quality of raw coal has tended to decline. At the same time, expansion in the amount processed has effectively improved the quality of commodity coal and there has been a 7 percent reduction compared to the ash content of raw coal.

4. Coal dressing technologies have gradually improved, technical levels are continually rising. The only coal washing methods used in the early 1950's were jiggling and chutes. The dressing efficiency was low, product quality was poor, much coal slurry was lost, and there was serious freezing of machinery during winter coal washing in north China. Over the years, chute washing was abandoned and flotation has been universally adopted at coking coal dressing plants. Symmetrical cycle vertical air valves used in jiggers became horizontal cyclone valves and developed into modern numerical control air valves. In the 1980's, we imported (Badage) model jiggers. Shuangyashan Coal Dressing Plant developed a new type of jiggling screen plate with an open hole efficiency of 82 percent. After several improvements, the imperfection rate of jiggers was reduced from 0.2 to 0.25 down to below 0.15. In the late 1950's, Buxin Haizhou Strip Mine's coal dressing plant successfully used heavy medium oblique wheel sorters for the first time to replace manual gangue picking. In the late 1970's Benxi Caitun Coal Dressing Plant use heavy medium swirlers and achieved a combined technique using full heavy medium and flotation. In the early 1980's this plant also used three-product heavy medium swirlers developed by

the Tangshan Branch of the Coal Science Academy to improve powdered coal dressing techniques. The new technique using jiggling for coarse dressing and heavy medium swirlers for fine dressing is now in use at Qitaihe Taoshan and other coal dressing plants. All coal dressing plants in high frigid regions have added fire drying workshops that reduce the water content of washed and cleaned coal to 10 percent. Application of pressure filters and flocculants in recent years has perfected coal slurry water processing systems and about half of our coal dressing plants have achieved closed-loop circulation of washing water. Screening has developed quickly in recent years. With the extension of depth screening in northeast China, sized coal output now accounts for 31.7 percent of total commodity coal output. The inclined chute backflow sorting method, spiral chute sorting method, shaking bed, air dressing, and other methods are all being used.

It is apparent that China's coal dressing techniques come close to those in the world's main coal producing nations. All the coal dressing methods commonly used in various countries are being used in China (Table 3). The jiggling method is the most widely used in China (60 percent). The reason is that most older coal dressing plants use jiggers and that this method is highly adaptable, has rather good sorting efficiency, and requires lower capital construction investments and production costs. This is especially true following continual improvement. Satisfactory results have been achieved using jiggling to wash and dress easily-dressed and moderately dressable coal. The heavy medium method is mainly used for gangue removal from block coal and processing extremely hard-to-dress coal.

Table 3. Proportions of Various Coal Dressing Methods in Several Countries (percent)

Country	Jigging dressing	Heavy medium dressing	Flotation	Shaking bed and other	Total
China	60	23	14	3	100
Soviet Union	48.8	23.6	9.9	17.7	100
United States	46.3	32.0	4.4	17.3	100
Australia	16	57	15	12	100

5. Continual appearance of new equipment models. The pace of development of coal dressing equipment has greatly accelerated over the past decade. The appearance of probability screens, equal-thickness screens, wire screens, and spiral screens have made dry method depth screen separation possible. Extension of various new vibrating screen structures has increased the reliability of equipment operation. Systemization and enlargement (35 m^2 large machines) of below-screen air chambers with numerical control air valves and side-screen air chamber jiggers has provided several types of machines that can be chosen. Large oblique wheel heavy medium separations with chutes 4 m wide have been in use for several years at Fushun West Strip Mine. Moving screen jiggers have already passed technical examination and acceptance. Inclined chute sorters with chutes 1 m wide have been successfully used at Hegang Dalu Mine. The

birth of Chinese-made 12 m^3 mechanical flotation machines and vacuum filters with an area of 160 m^2 have strengthened the flotation industry. Utilization of 500 m^2 and $1,050 \text{ m}^2$ box filter presses, 3.5 m belt-type filter presses, sedimentation filter-type centrifuges, and high efficiency concentrators has improved the mine tailings processing industry. The appearance of TLL-10 spiral dumping centrifuges has doubled the dehydration capacity. China's machinery manufacturing industry is now entirely capable of providing full sets of equipment for 3 million tons/year (or even larger) coal dressing plants.

6. Obvious achievements in transforming old plant. Several old plants have been perfected and grown through technical transformation and have taken on very heavy production tasks. For example, transformation

and expansion of 19 old plants in northeast China increased their design capacity to 32.15 million tons/year (12.95 million tons/year of newly added capacity), which is 54.1 percent of the coal dressing capacity of the East China Coal Company. Practice has confirmed that transformation and expansion of old plants saves investments, involves short construction schedules, and can quickly form production capacity, with a capital repayment period of 1 year or less. Fushun Laohutai Coal Dressing Plant is a typical example of expansion. The design capacity of this plant was increased from 1.5 million tons/year to 3 million tons/year. They changed from washing chutes to jigging, added more flotation workshops, and achieved computer-controlled automation of the production process. The profits from processing 1 ton of raw coal reached 45.12 yuan, up 20.2 percent from before the transformation.

7. Integrated scientific research, design, and machinery manufacturing bodies have appeared, creating the conditions for developing and extending new technology. As reform of the economic system has intensified, the coal industry has successfully used huge enterprise groups as a basis for horizontal integration of scientific research, design, machinery manufacture, and production units that are involved in new coal dressing equipment development. The Northeast China Joint Coal Mine Dressing Equipment Company is an example. In just 1 and ½ years, they developed eight new equipment models including a moving screen jigger, large centrifuge, and so on in conjunction with 30 units that included academies, research institutes, and plants like the Tangshan Branch of the Coal Science Academy, Pingdingshan Coal Dressing Design Academy, Chinese Mining University, Northeast China College of Engineering, Luoyang Mining Machinery Plant, Sino-Japanese Joint Investment Chengcheng Electronics Company, and East China Coal Company System. The equipment was welcomed on site, showing the superiority and vitality of this type of cooperative arrangement.

8. Improved enterprise quality, obvious economic benefits. Over the past 2 years, we have completed several quality standardized and modernized coal dressing plants and there have been obvious improvements in enterprise management levels. Reliance on technical progress and more scientific enterprise management have substantially increased the economic benefits of dressing and processing. China's unified distribution coal mines earned 2.2 billion yuan in profits from coal dressing during 1989 which help alleviate economic problems in coal mines. The experience of the East China Coal Company confirms that in besides the benefits from dressing coking coal, substantial income also can be earned from processing power coal. Dressing and processing can increase the value of raw coal by an average of 40 percent.

China's coal dressing industry has already achieved a substantial scale. Still, it has a weak foundation with growing economic and technical forces, so we lag somewhat behind the main coal producing nations. This is

manifested primarily in a low washing proportion, poor product quality, a product mix that still cannot satisfy user demand, sub-optimum technical economics indices (especially labor productivity), and the need for further improvement in coal-water mixture and mine tailings processing.

II. Development Prospects for the Coal Dressing Industry in the 1990's

China has now surpassed the benchmark of 1 billion tons in raw coal output and this figure is expected to reach 1.4 billion tons by the end of this century. Still, there is enormous waste in China's coal utilization. China's coal utilization rate is at least one-third lower than the developed nations, which means that we actually use 700 million tons of the more than 1 billion tons we produce. It is apparent that conservation is the same as increasing output. Everyone knows that the cost of coal conservation measures is far less than the investment required to increase coal production capacity. Investments in this area can produce many times the benefits with less effort. Of course, raising coal utilization rates is not easy and involves systems engineering among a whole variety of departments. The starting point for this enormous project is dressing and processing. Coal mines must supply the market with good quality products that meet requirements before users can effectively utilize coal.

This shows that accelerated development of coal dressing is essential for healthy development of the coal industry. Considering China's investment capabilities, it would be best if the development goals we set for the next 10 years are not too high. According to forecasts from the relevant areas, it will be possible to increase the coal dressing capacity to 300 million tons by the year 2000, which means an average yearly increase of 10 million tons. When this plan is achieved, the proportion of raw coal that is washed will be about 21 percent.

This goal cannot be considered high but implementing it will be rather difficult. To ensure the achievement of this goal, we must start with actual conditions and formulate correct development strategies. I propose:

1. Omnidirectional development of dressing and processing. When we say "omnidirectional", one meaning is to orient toward all users and another meaning is dressing both coking coal and power coal. In the 1950's, coal dressing only served the iron and steel industry and led everyone to think that only coking coal had to be washed. This superficial concept still affects some people today to varying degrees. We must be clear that providing the iron and steel industry with high-quality clean coking coal is one of the main tasks of coal mines. Still, the coal used for coking is just one small part of coal consumption (about 7.8 percent). The biggest coal users are power plants and various types of coal-fired boilers. The efficiency of power boilers and the ability of power plants to operate economically is inseparable from the specifications and quality indices of coal varieties. Moreover, many other users who use coal as a raw material

and fuel have their own different requirements. This is the basic principle behind the need for omnidirectional development of coal dressing and it is the foundation for formulation of correct development plans.

2. The two categories of coal dressing plants must be developed simultaneously. Guided by the concept of "washing coal to protect steel" in the past, distinctions were made between coking coal dressing plants and power coal dressing plants, and they had a different status and received different treatment. While clarifying omnidirectional development, we naturally must eliminate the walls separating these two categories of coal dressing plants. Of course, the techniques and product mixes for washing coking coal and washing power coal are different and some distinctions must be made in certain situations. Still, this sort of distinction does not mean that there are differences in the importance of the two and they should be treated equally without discrimination in future development policies. At the same time, for actual coal dressing plants, it would be best in many situations for them to have dual-purpose production functions for coking coal products and power coal products. This means that "clean smelting coal" should not be treated as a "patented product" for coking coal dressing plants, nor must we restrict product diversification in coking coal dressing plants. From the perspective of users, what they require is coal variety trademarks and quality specifications, not hanging some sort of sign on coal dressing plants. Experience in northeast China over the past few years has proven that this benefits rational utilization of coal and conforms to the principle of maximum economic benefits.

3. Optimize investment structures, improve capital benefits. China has had a long-term shortage of capital construction funds. The state has adopted slanted policies for the energy resource industry but "hunger and thirst" for investments in coal mining have been hard to eliminate. In this sort of situation, using our limited capital in the best way is related to healthy development of the entire coal industry. A common method is that when there are insufficient investments, we abandon coal dressing plants and other things and only protect mine construction. The result is that raw coal output rises while the economic state of coal mines declines, forming a vicious cycle that is hard to leave. Summarizing historical experiences, a correct investment policy should use special capital that combines formation of a certain raw coal production capacity with matching completion of coal dressing capacity. When capital is insufficient, the scale of mines can be reduced but we must also build coal dressing plants simultaneously. Only in this way can the investment structure be optimized and the maximum benefits of capital be obtained. If future construction of new mines and strip mines is always matched with construction of coal dressing plants and existing coal mines that have the proper conditions can build or expand coal dressing plants, we can achieve the goal of 300 million tons in coal dressing capacity by the end of this century.

When planning and designing coal dressing plants, to achieve low processing costs and good economic results in coal dressing plants after they go into operation, we must be concerned with rational deployment of plant types. Plant types for coal dressing plants should be chosen according to mining region and mine conditions. Large mines should be configured with mineshaft-type plants while medium-sized and small mine clusters should establish clustered mine-type or mining region-type coal dressing plants according to transport conditions. Based on China's conditions, mineshaft-type plants have lower production costs but their development vigor is weaker.

4. Accelerate technical transformation in old plants. Old plants have already made substantial contributions, but as time passes it is hard for them to avoid becoming outdated and aged. These plants have rich management experience, relatively strong technical forces, and rather good quality employees, and we should take advantage of these good conditions and use technical transformation to restore them to their youth. This means gradually replacing equipment and putting in matching technical links, and the better ones can use modern electronic technology to automate the production process and turn them into modernized coal dressing plants that play an even greater role.

5. Local coal mines also should develop coal dressing. Output from local coal mines now accounts for more than half of the structure of raw coal output in China. Although 39 percent of the raw coal from unified is washed, only about 17 percent of the equivalent output of raw coal in all of China is washed. In recent years, some medium-sized and small local coal mines with rather good conditions have built or are now building coal dressing plants, some of which are medium-sized coal dressing plants with perfect techniques and excellent equipment. Overall, however, the amount washed in local coal mines is still very small, estimated at only about 10 million tons per year. To change this situation in which the proportion of raw coal washed nationwide is too low, in the future we must promote development of the coal dressing industry. For this reason, we should develop coal dressing plants that are moveable and can be assembled and we should put forth systemized standard designs for small simple plants and provide sets of equipment supplies and technical services.

6. Raise product quality, optimize product mixes. We should use dressing and processing to comprehensively improve the quality of commodity coal, reduce the ash content, water content, and sulfur content, and the below-limits rate for block coal. We also should integrate with market demand and optimize product mixes in accordance with the principle of maximum economic benefits. Improvements in product quality and optimization of product mixes are often mutually complementary. For example, we can grade clean coal based on the grain size and ash content characteristics of coal, and produce, respectively, clean powdered coal with lower ash content, blocks being washed that are in urgent

demand, and so on. These measures can improve the quality of cleaned coal and fully recover resources, and they can derive optimum economic benefits. To achieve product diversification, adapt to raw coal quality and market changes, and make rapid responses, we should establish flexible and adjustable technical flow processes. To achieve a comprehensive improvement in product quality, centrifugal dehydration should be carried out year-round both for washed and cleaned coal and for washed powdered coal. Coal dressing plants which lack drying workshops should create the conditions for carrying out year-round fire drying. We should employ high efficiency grading screens and adopt breakage prevention measures in the storage process to ensure the size of block coal. Coal dressing plants with the proper conditions should adopt raw coal quality homogeneity measures and use them to stabilize the production process and product quality. In addition, implementing comprehensive quality management and establishing quality assurance systems are indispensable organizational guarantees.

7. Develop coal dressing plants without public hazards and waste materials. Dressing and processing coal helps reduce environmental pollution that occurs during the coal utilization process and aids in environmental protection. However, the coal slurry water and discarded gangue discharged by coal dressing plants can also pollute bodies of water and the air, degrade the environment in mining regions, and take up cultivated land. To achieve a fundamental change in the situation at coal dressing plants, we must perfect techniques for dealing with coal slurry water and mine tailings, achieve closed cycles, develop technologies for local processing and utilization for gangue and flotation mine tailings (such as manufacturing construction materials, fuel for fluidized-bed boilers, and pit-mouth power plants), try to avoid discharging gangue and mine tailings, eliminate coal slurry ponds and gangue heaps, and become coal dressing plants without public hazards or waste materials (or fewer waste materials).

8. Raise management levels, build quality standardized and modern coal dressing plants. Extend all sorts of effective scientific management methods, popularize computer-aided management, increase management efficiency, comprehensively improve all technical economics indices, make major efforts to raise labor productivity.

III. Modernization of Coal Dressing Technology and Technical Equipment

The development of coal dressing must rely on technical progress and achieve modernization of technology and equipment.

1. Technology. Modern coal dressing should have simple, perfect, highly efficient, and flexible technical flow processes.

"Simple" refers to few technical links and little auxiliary equipment. For example, in heavy medium separation,

using three-product swirlers is much simpler than two-step separation with two-product swirlers, but the separation results are about the same. When dumping large blocks of gangue, using moving screen jiggers can reduce the need for auxiliary equipment compared to heavy medium sorters.

"Perfect" means that technical flow processes must have comprehensive guarantees of product quality and be able to reduce process losses and achieve closed-loop cycling of washing water.

"Highly efficient" means a high sorting rate and large unit production capacity.

"Flexible" means that the technical flow processes must be adjustable and capable of immediate changes in product mixes according to changes in raw material coal base areas and coal markets to regularly maintain optimum economic results.

To achieve these goals, I offer the following proposals:

It would be best for coking coal dressing plants which process easily-dressed and moderately dressable coal to continue using the jigging method because of the simplicity, rather good sorting results, and low production costs of this method, and it is more conducive to establishing flexible and adjustable flow processes.

Coking coal dressing plants which process hard-to-dress coal can use solely heavy medium sorting or combined jigging and heavy medium techniques to help achieve satisfactory quality and quantity indices.

The typical technical flow process in modern coking coal dressing plants in Canada is: using a rolling tube breaker to break the raw coal into pieces smaller than 50 mm in one pass and after mud removal, using heavy medium swirlers for sorting the 50 to 0.5 mm grade, tri-cone water medium swirlers for 0.5 to 1.5 mm coarse coal slurry, and flotation for 0.15 to 0 mm fine coal slurry. This technology is simple, highly effective, and perfect, and China's coal dressing plants which dress strongly bonded hard-to-dress coal can serve as examples. Most of the technology in the authigenic medium swirler and flocculant oil group dressing method proposed by Dr. Weissman is simple, but it is only suitable for easily dressed coal.

With the continued increase in coal slurry output, it would be best to process coarse and fine coal slurry separately, using heavy dressing methods (repeated vibration jigging, water medium swirlers, and so on) for sorting the former and the flotation medium for sorting the latter, to reduce the flotation procedure burden that has rather high processing costs and to improve the results of sorting coarse coal slurry.

The moving screen jigging method is technically simple and has a high sorting efficiency, and it can be used to remove gangue from large block coal. Coal dressing plants can use it to replace manual gangue removal, selective breaking, and the heavy medium method. This

method can also be used to transform screening plants and achieve mechanized gangue removal.

It would be best for power coal dressing plants to use high efficiency grading screens to carry out dry method depth screen sorting to determine the ash content of raw coal to screen out -6 mm or -13 mm screen residual coal. This can reduce the load on dressing and coal slurry water processing activities as well as reduce product water content and losses.

For low water content (> 5 percent) raw coal, we can use the wind sorting method and there is some hope of using the air heavy medium sorters now being developed.

Inclined chute backflow sorting method equipment is simple and can be used for dressing block coal and low quality coal.

Most coal slurry water treatment and coal slurry recovery activities now used in power coal dressing plants are imperfect and must be improved. Usually, we can use shaking beds or spiral chutes to sort the coal slurry and use high frequency vibrating screens and belt-type vacuum filters, sedimentation filter centrifuges, and pressure filters to carry out coal slurry dehydration and recovery.

Screening plants should develop dry method depth screening. Using wire screens can reduce the lower limit of grading to 13 mm or 6 mm to increase the sized coal output rate.

2. Technical equipment. Summarizing developments in coal dressing technology in recent years, no major improvements have appeared in the area of techniques. It will also be hard to make major breakthroughs within the foreseeable future. Thus, technical progress in coal dressing must come mainly from updating and replacing technical equipment.

The development directions for coal dressing equipment are: high efficiency, large size, and reliability.

Equipment "high efficiency" refers to the need for high technical efficiency, large unit processing capacity, and low energy consumption.

"Large" equipment means the need to develop large coal dressing plants in order to organize single system or small system coal dressing plants as well as the necessity of making comprehensive improvements in coal dressing plant technical economics indices.

Equipment "reliability" refers to long term operation without breakdowns and extended maintenance schedules and lifespans.

In addition, modern coal dressing equipment also should have small dynamic loads, low noise, and other characteristics.

China has imported and digested new technology from foreign countries over the past several years, and we have

developed many new models of coal dressing equipment on our own. On this basis, the conditions now exist for carry out all-direction and systematic development. My suggestions for preferential development of coal dressing equipment over the next 10 years are: 1) Moving screen jigger systems. We should develop two models for dressing 400 to 50 mm large blocks and 100 to 13 mm moderately coarse grains for use, respectively, in gangue removal from large blocks and producing washed block coal. 2) Adopt numerical control air valves and combine them with achievements in new types of jigger systems in recent years. 3) Re-vibration jiggers. These are used to dress powdered coal and coarse coal slurry with a cleaning and dressing depth of 0.1 mm. 4) Large heavy medium sorters: vertical wheel type and shallow chute type. 5) No-pressure feeding three-product heavy medium swirlers. These are used for sorting 50 to 0.5 mm raw coal. 6) Authigenic medium swirlers. These are used for water medium sorting of powdered coal and coarse coal slurry. 7) Large (12 m^3 and larger) jet flotation machines. 8) Large (16 to 25 m^3) mechanical flotation machines. 9) Flotation columns (air pressure flotation machines). 10) Power coal slurry sorting equipment (spiral sorters, shaking beds, and so on). 11) Various types of new structure heavy, circular motion, and direct line vibrating screen systems. 12) Wire screen systems. 13) Spiral screen systems. 14) High frequency vibrating screen systems. 15) Spiral dumping filter-type centrifuge systems (models TLL-10 and TLL-11). 16) Sedimentation filter-type centrifuge systems. 17) High speed centrifuges. These are used for dehydration of powdered coal and coal slurry. 18) Large plate-type vacuum filters and pressurized filter systems. 19) Belt-type vacuum filter systems. 20) Unformatted folded-belt vacuum filter systems. 21) High efficiency concentrator systems. 22) New structure rolling tube dryers and matching fuel boiler systems. 23) Fluidized bed dryers. 24) New pulverizers (with an upper load discharge granularity limit of 8 to 3 mm) used to pulverize washed gangue. 25) New toothed roller breakers used to break block coal that contains gangue and hard block coal. 26) High pressure centrifuge blower systems (for use with jiggers). 27) Slag liquid pump systems. 28) Deep chute conveyor systems. 29) Variable speed bucket hoist systems. 30) Resonant feed systems. 31) Jiggers combined with automation systems. 32) Flotation machines combined with automation systems. 33) On-line ash measurement devices. 34) On-line heat output measurement devices. 35) Rapid car loaders and counting systems. 36) Computer central control systems and various types of sensors.

IV. Guarantees and Measures

1. Open up capital channels, increase capital inputs. In the coal industry, coal dressing is the department with the most obvious economic and social benefits. Increased investments in this department will aid healthy development of the coal industry. For a long time, 5 to 7 percent of China's coal mine capital construction investments have been used for coal dressing

plants. The proportion of investments in this area should be raised to more than 10 percent to ensure coordinated development of coal mining. Transformation and expansion of old plants is a fast and economical way to develop coal dressing but transformation and expansion plans in many old plants have not been implemented because the required capital was not available. The state should encourage loans to enterprises and permit enterprises to use the additional profits after project completion to repay the principle and interest. This also means that they will turn over profits and taxes to higher authorities after the loans are repaid. Depreciation costs and major overhaul costs in coal dressing plants should be set sufficiently high to benefit equipment renewal and repairs.

2. Further readjust coal prices. The main problems with coal prices are one, prices are far detached from value and coal mines are experiencing serious losses. Second, parity prices for product varieties and grades are not reasonable and do not help development of dressing and processing. Coal price levels are a major state materials prices issue and this article will not consider them. Coal parity prices, which arrange the coal type, product variety, and quality relationships on the basis of maintaining price levels, and are rather easily readjusted. In the early stages, the guiding ideology for formulating parity prices was to use the price of raw coal as a basis and then, after processing products and grades with different contents, setting weighted average prices (with small processing fees added) for each type of product that were still approximately the same as the price of raw coal. Practice over many years has shown that this concept should be changed because the various coal products after processing are not the same as raw coal. For the corresponding users, suitable products have their own rather high use value, so they should not be simply restricted by raw coal prices. For example, after grading raw coal into block coal and powdered coal, the price of powdered coal cannot be forced down because the parity price of block coal has been raised. Actually, it is much better for power plants to use powdered coal than raw coal, and several power plants have been willing to pay a processing fee of 4 or 5 yuan for powdered coal in the past few years, which shows that a suitable increase in the parity price of powdered coal is reasonable. Second, metallurgical departments have been calling for reducing the ash content of clean smelting coal for many years. Although the relevant departments have made several attempts, the benefits so far are minimal and the crux of the problem is still the question of prices. It is apparent that both parties, coal mines as well as users, must benefit before they will be more willing to improve the quality of clean coal. This shows that the formulation of rational parity price relationships has a very important relationship to promoting the development of coal processing.

3. Scientifically assess achievements in coal mine administration, perfect economic contractual responsibility methods. The measurement system for raw coal that

took shape during the 1950's in China has many defects and is no longer adapted to actual conditions in the coal industry. Although some consideration was given to shifting to commodity coal measurement, nothing was done because of the difficulty involved. A realistic method is to perfect measurement of raw coal, link output and quality, tie the two together for assessment, and use this as a way to rectify the tendency toward a superficial pursuit of output without consideration for quality and an unwillingness to expand processing. State requirements for coal mines now concern raw coal output, but commodity coal output is used when coal is distributed. To ensure that sufficient resources are available for distribution, we are forced to assign washing consumption indices to coal mines and these are watched very closely, with the result being that the amount washed is restricted with unfavorable results. The state should relax its control of washing consumption and change to assigning directive plans for commodity coal quantity and quality.

4. Establish a new technical development fund, support scientific research work. Technical progress in coal dressing is based on scientific research. China has now put together a powerful scientific research staff that is the basic force which promotes development of coal dressing technology. Research concerning basic theories in coal dressing and long-term new technology projects should be funded by the state. It would be best to establish a new technology development fund for applied project development to provide support in the form of interest-free or low interest loans. We should also organize integrated bodies for research, design, and manufacture of coal dressing equipment, which is another arrangement that can be adopted to aid development of new coal dressing technology.

Inner Mongolia Adds 6.69 Million Tons in New Capacity in Seventh 5-Year Plan

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7 Dec 90 p 1

[Article by reporter Li Shuxiu [2621 3219 4423], and correspondent Gu Laibin [6253 1140 6333]]

[Text] During the Seventh 5-Year Plan the opening up of new coal fields in China moved westward, and the coal industry of Nei Monggol developed steadily. The total coal production from local State-operated and community mines was 193 million metric tons. The forecasted production for this year is 45 million metric tons, an increase of 13 million or 40.45 percent over the last year of the Sixth 5-Year Plan. The average annual increased production was 2.6 million metric tons, or a progressive annual increase of 7 percent.

During this period national investments for coal were 2.9 billion yuan, an increase of 900 million over the Sixth 5-Year Plan. There were 17 newly opened open-pit mines with an estimated capacity of 29.46 million tons,

and 17 new open-pit mines went into production for a new increased production capacity of 6.69 million tons.

In this period, a number of large modernized underground mines have been constructed and gone into production. They are the Gongwusu No 3 mine of the Haibowan Mining Affairs Bureau, the Hongmiao mine of the Pingzhuang Mining Affairs Bureau, and the Huangbaici inclined-shaft mine of the Wuda Mining Affairs Bureau with a combined total production capacity of 1.2 million tons, which greatly increases the reserve strength for China's coal production.

In this period, the programming and construction of large scale open-pit mines in the autonomous region have caught the attention of the country. The Junggar Heidaigou single-phase construction project, the Huolinhe No 1 open-pit 2-phase construction project, and the Yuanyushan open-pit project. These mines, which scale out to 12, 7, and 5 million metric tons respectively, were opened one after the other. Upon completion their new increased capacity will be 24 million tons.

The new local coal mine construction sites spread over six Leagues and two cities. In this period, medium and small open-pit mines of 60,000 to 600,000 ton capacity

have gone into production at 11 locations, for new production capacity of 1.65 million metric tons. Once the Xireheda, the 59, and the Manzhouli mine went into production to serve the frontier pastoral and forestry regions, they had a positive impact on the local economy, on improving the ecological environment, and in preserving the flora of the area by overcoming the established pattern of using grass and wood in place of coal.

The progress of construction of the Dongsheng coal processing base, and the Gulamu coal export base was quite fast. The Bao[tou]-Shen[mu] railroad was constructed through the Dongsheng coal fields during this period, and the Majiata open-pit mine, the Houbulian, Liuta, and Cuncao underground mines that went into production in the Dongsheng mining district have a new increased production capacity of 1.35 million tons. Open-pit mines are being opened at six locations with an estimated capacity of 3 million tons. In the Gulamu coal mining district, the No 2 underground mine, which went into production, has a new increased production capacity of 210,000 tons, and a number of formerly manually operated small coal pits have also been mechanized.

Nation's Oil Industry Undergoing Expansion

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[Article by reporter Liu Xudun [0491 1645 4163]]

[Text] From 1981 to 1990 China's crude oil and natural gas output increased noticeably. The 10-year cumulative output was 1.226 million metric tons, a 36.6 percent increased annual output over the previous 10 years. China's crude oil output is 5th in the world. In these 10 years China's proven petroleum geologic reserves were 1.7 times what they were before reforms, and the cumulative new construction of crude oil production capability was 130 million metric tons.

China's petroleum industry development was accomplished through scientific advancements. By dint of Chinese S&T, and imported advanced technology, several aspects of Chinese oil and gas prospecting have approached or caught up to top world class levels of the 1980s, and in some respects have even surpassed world class. Daqing oil field's annual production level of more than 50 million tons has been maintained for 15 years, and this year it has reached 55.6 million. This indicates that China's large sandstone exploitation technology outpaces the world's front ranks. In the Shengli oil field's multiple fault-block geology where repeated prospecting and development of oil and gas reserves was done, the output of crude oil doubled in 10 years. A complete series of industrial technologies that were developed for the extraction of heavy, and high viscosity oils at Liaohe, and Xinjiang oil fields has achieved large-scale production, and now China's heavy oil output is 4th in the world.

The Eighth 5-Year Plan and following 10 years will be a period of growth for China's petroleum industry, and its prospects are excellent. China's petroleum industry has been beefed up by technology enabling the old oil regions to maintain solid growth. Daqing produces 40 percent of the nations crude oil, and that will hold through the year 2000. Nearly half of all the country's oil comes from the Bohai Gulf region oil fields, and its oil and gas output will continue to grow. Great gains have been made through exploration of the new regions in western China, and that has opened up new vistas for the overall development of the petroleum industry. During the Eighth 5-Year Plan, not only can large scale oil geology reserves be ferreted out, but good production capacity can be had there.

This year China's natural gas output has reached the highest level in history, and exploration has been very gratifying. Sichuan's old gas region continues to yield vast reserves of gas fields, and gas exploration in the Shaanxi, Gansu, Ningxia basin has been pushed ahead, and now, in a single collectively dissected 1,200-square-kilometer area, not one exploratory well has come up empty, and the output has been high.

Despite Higher Output, Outlook Not Optimistic for Meeting Demand

916B0032D Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 7 Jan 91 p 3

[Article by reporter Xie Ranhai [6200 3544 3185]]

[Text] In 1990, China's petroleum output was 138.3 million tons, and natural gas was 14.7 billion cubic meters. This clearly shows that since 1986 China's total oil and gas production volume has maintained fifth place in the world for five successive years.

But as China's major eastern oil fields pass through a period of peak oil extraction, maintaining a high water mark, during the Seventh 5-Year Plan it has become apparent that the petroleum industry's annual net increase in output is abating. The 1986 total increased over 1985 by 5.78 million tons, but 1989 is up by only 600,000 tons over the previous year, reducing the four-year net increase by more than 8/9ths.

In 1990, through great efforts by the oil system, the decline was stopped, and the net increase rose above the previous year by as much as 7 million metric tons. This illustrates the growing difficulty for old oil fields to sustain large scale growth, and if fairly strong growth in oil and gas output is to be maintained through the next 10 years, the key will be to rely on growth of proven reserves. There has been some good news in this area. In the oil industry's main replacement regions, the Jilun-nan, Yingtouli, and Tazhong areas of the Tarim Basin, after very fruitful exploration, the Ministry of Petroleum again made a big find in the Donghetang area of the northern Tarim Basin, of which the Donghe No 1 exploratory well found in a single oil layer, a sandstone oil pool over 100 meters deep, and after going down 44 meters, drew up 837 cubic meters of crude oil per day. According to geologic resource analysis, there is a good possibility of finding several high yield oil fields there. In the Turpan-Hami basin, an oil field with reserves of up to 100 million tons was found, and in another new geologic structure a layer over 90 meters deep was found, tested, and yielded a gas and oil flow. In the Eighth 5-Year Plan, not only will a fairly large-scale reserve be found there, but development of a good production capability is assured.

At this time natural gas exploration findings are most satisfying. In the old gas fields in eastern, central, and northwestern Sichuan quite large reserves continue to be discovered. In the Shaanxi, Gansu, and Ningxia basin, on a 1,200-square-kilometer area, not a single exploratory well came up empty. The daily average output for gas wells was 100,000 to 300,000 cubic meters. Recently, systematic testing of five wells have brought up an unobstructed high volume flow of 110,000 cubic meters, showing that in the Shaanxi, Gansu, Ningxia basin there is real hope of finding a new gas region.

Although it is hoped that during the next 10 years there will be a steady growth in oil and gas production, the

population is large, and averaged to population, gas is a low-volume commodity. The supply and demand outlook for oil and gas for the next 10 years is not an overly optimistic one. China's petroleum output in 1978 broke 100 million metric tons. The output for 1990 is one-third more than that, but because of population growth, per capita consumption has increased very little, and is still about what it was 10 years ago; only one-fifth of the world average. The Ministry of Energy Resources plans by the year 2000 to reach a 200 million ton output, and 30 billion cubic meters of natural gas, but by that time the population of the country will increase to more than 1.2 billion. Averaged out, it will still be one-fifth of the world per capita consumption rate. Even if China can make larger discoveries through prospecting, the time required to convert that into reliable production will be at least 4 to 5 years, at most, 7 to 8 years.

Experts believe that in the next 10 years China's oil and gas supply situation will be tight, even to the point of having a gap in supply and demand.

For oil and gas output in the next 10 years to satisfy, as much as possible, the people's economic development needs, a policy of "growth and conservation are equally important" must be observed. Experts believe the key will be in grasping the two aspects of the policy: one, increase input to speed oil and gas field prospecting and construction, and two, reduce waste, which is a common occurrence, and at the same time the idea of "convert from oil to coal" must be pushed in order to continue the effort to change the proportion of oil-burning power plants, so that the limited petroleum resources can be used to best advantage.

Ministry To Step Up Oil, Gas Prospecting in Eighth 5-Year Plan

916B0040C Beijing JINGJI RIBAO in Chinese
18 Jan 91 p 2

[Report by Staff Correspondent Ji Weigong and Reporter Gao Ruifang]

[Text] The Ministry of Geology and Mineral Resources recently made plans for the exploration of oil and natural gas in the Eighth 5-Year Plan.

The Seventh 5-Year Plan saw significant progress in oil exploration geology and oceanic geology, particularly in the Tarim Basin, and the East China Sea continental shelf where important breakthroughs were achieved. Geological surveys in the Antarctic Ocean, China's first scientific work in the South Pole, have also begun.

During the Eighth 5-Year Plan Period, the Ministry of Geology and Mineral Resources will start exploration for oil and natural gas in areas such as the Song-Liao Basin, the North China Plain, the Jiangsu-Zhejiang-Anhui region, the Hunan-Hubei area, the Sichuan and Tarim basins, the East China Sea, the South China Sea, and northern Tibet. The Ministry insists on exploration of new fields, new areas, new types, and new depths as the

core of the work. The Ministry will also explore new bases for prospecting oil and natural gas, concentrate on discovering large-to-medium oil and natural gas fields in the Tarim Basin and the East China Sea, step up exploration of natural gas, including coal-associated gas, work towards progress in shallow strata and small basins in Central and East China and develop complex small oil and gas fields.

The Tarim Basin is the only large-scale, land-based oil and natural gas basin in China where the exploration level is relatively low. Oil and natural gas resources in this region are estimated to be very rich. At present, it is the time to get a foothold in the northern Tarim and start a comprehensive survey of the whole basin. The East China Sea is the only marine area in China not yet open to foreign exploration. Its resources are estimated to be considerable. So far, an oil and natural gas concentration and collection belt of the flat-lake structural type has been discovered and the Ministry is actively involved in planning and coordinating the preliminary prospecting of oil and natural gas fields of this type.

Energy Ministry Creating 'Brain Trust' to Address Difficult Issues

916B0032C Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 7 Jan 91 p 1

[Article by reporter Xie Ranhao [6200 3544 3185]]

[Text] In order to advance a policy that is democratic and scientific, and to reduce and avoid major policy errors, the Ministry of Energy Resources has decided to invite Wang Dexi [3076 1795 3556], Luo Xibei [5012 6007 0554], and 34 Chinese economists, technicians, and administrative experts for ministry level consultation.

On 5 January at the convening of the All China Energy Work Conference in Beijing, Minister Huang Yicheng, and Vice Minister Shi Dazhen [0670 1129 2823] of the Ministry of Energy Resources, and Lu Youmei [7120 0147 2812], will present letters of appointment to 34 experts.

The 34 experts who were invited by the Minister to make up a high level "brain trust" have been engaged in energy operations and research for many years. They represent, coal, electric power, petroleum, and nuclear industries, various economic research departments of the State Council, universities and colleges, among whom are those who have been recognized by Comrade Deng Xiaoping for their outstanding contributions, Chinese Academy of Sciences academic department committee members, and presidents of Qinghai University, and major specialty colleges.

In a speech given at the letters of appointment ceremony, Minister Huang Yicheng said that the high level "brain trust" was being formed to enable the Ministry of Energy Resources to establish democratic and scientific policy, and that hereafter, before the Ministry makes policy

decisions it wants to hear the opinions of high level advisors. He asked each expert to combine genuine experience and understanding of actual situations in offering their opinions and suggestions. In closing, the Minister said all means would be exhausted to create a proper environment and ambiance for the experts in which to do their work.

Offshore Operations May Produce 8 Million Tons by 1995

91FE0409A Beijing CHINA DAILY (Business Weekly) in English 11 Feb 91 p 1

[Article by Xu Yuanchao]

[Text] China's offshore oil industry is expected to increase its production capacity to 8 million tons by 1995, a target set for the current five-year plan by the China National Offshore Oil Corporation (Cnooc).

A Cnooc official said the production capacity of natural gas was set to grow to 3.75 billion cubic metres over the next five years.

There were 11 offshore fields which would go into different stages of development over the five years, the official said, adding that the Huizhou 26-1 and Weizhou 10-3N oilfields in the South China Sea were scheduled to go into operation this year.

The Jinzhou 20-2, an oilfield in the Bohai Bay which mainly produces condensate and natural gas, would go into trial operation in July next year to ensure that it would be able to supply gas to the Jinxi chemical fertilizer plant in August, he said.

The corporation had signed a supplementary agreement with the Amoco Orient Petroleum Company of the United States to jointly develop the Liuhua 11-1, the largest offshore oilfield in China.

Both parties, the official said, were expected to inject \$500 million into construction of the oilfield which is scheduled to go into operation by 1995.

The overall development plan for the other four oilfields would be submitted to Cnooc for approval before the end of this year, he said.

China expected its offshore fields to turn out 1.8 million tons of crude oil this year, about 540,000 tons up on last year's output.

He said regional companies under Cnooc would step up exploration in search of medium-sized and small oilfields in the Liaodong Bay and the Beibu Gulf in order to make good use of the existing facilities there for joint development.

In addition, he said, the corporation would strike a few test wells of strategic significance in the Yingge Sea, Dongsha Island, the South China Sea and the East China Sea.

Results of Natural Gas Geological Studies Recapped

916B0032B Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 29 Dec 90 p 2

[Article by reporter Niu Weigong [6873 1919 1872]]

[Text] During the Seventh 5-Year Plan China has made substantive advances in natural gas S&T, not only in theory of natural gas geology, but also in natural gas prospecting. Fruitful gains have been made that will accelerate and guide the development of China's natural gas industry. Key national S&T targets are embodied in the (Appraisal of Research on China's Natural Gas Resources), which is now under review at Nanjing.

This study is the result of a joint effort involving local mining departments, China Oil and Natural Gas Main Corporation, Chinese Academy of Sciences, State Education Commission, and 55 production, research, and education elements composed of nearly 1400 scientists and technicians of the coal industry system. This was a novel and unique approach taken to organize key players in the natural gas arena to put forecasting and prospecting of resources of dissimilar basins on a solid scientific basis. The distinguishing characteristics of variant natural gas formations were identified, and for the first time, gas formation rates of disparate types of biogas deposits were defined, which are advanced international level achievements that have filled a void in Chinese natural gas technology.

Having applied these laws of geological prospecting to a scientific appraisal of China's natural gas resources, it is predicted that there are four rich natural gas zones: 1) the northwest gas bearing zone, including the Tarim, Junggar, and Qaidam basins, of which the Tarim basin has the best prospects for one area of large and medium gas fields; 2) the coastal gas zone, including the gas basins of the East China Sea, and the northern South China Sea where a second important gas region can be developed, and where southeast Qiong[zhou], and the Xihu depression in the East China Sea have the conditions for large gas fields; 3) the Sichuan, Ordos gas bearing basins where development of medium and small gas fields should be possible; and, 4) the Bohai Gulf, and Songliao basin gas-bearing regions, which are expected to be of major commercial value, and where natural gas prospecting will soon begin. There are 12 priority areas for major prospecting in the Eighth 5-Year Plan, and 10 areas marked for the Ninth 5-Year Plan.

Major Fields Meet Crude Oil Targets

91FE0409B Beijing CHINA DAILY (Economics and Business) in English 20 Feb 91 p 2

[Article by Xu Yuanchao]

[Text] China now has 37 pipelines with a total length of 10,000 kilometres carrying oil and natural gas from its oilfields to 15 municipalities, provinces and autonomous regions.

An official from the Pipeline Bureau of the China National Petroleum Corporation said the national pipeline network had conveyed a total of 1 billion tons of oil and 1 billion cubic metres of natural gas in the past 18 years.

The pipeline system has earned about 8.7 billion yuan (\$1.6 billion) in pre-tax profits, more than double the government investment in its construction over the past 18 years.

The official said the turnover volume through the pipeline network averaged nearly 60 billion ton/kilometres a year, surpassing the volume of highway and air transport. (CD News)

The country's major oilfields met their crude oil output targets during January, according to an official from the China National Petroleum Corporation (CNPC).

The official told CHINA DAILY that the production situation in the oil industry was "optimistic," with daily output averaging 374,000 tons in January.

If output was sustained, the production target for the first quarter of this year would be fulfilled on schedule, he said, adding that the first three months of the year was the slow season because of icy weather and power shortages.

He said the Daqing Oilfield in Northeast China's Heilongjiang Province had produced 4.76 million tons of oil in January, a 1-per-cent rise on the same month last year and 50,000 tons up on the State target.

Fang Linyun, deputy chief geologist of the oilfield, said Daqing, China's largest field turning out 40 percent of the country's oil, had 25 proven oilfields, 14 of which had been put into production.

The oilfield was making every effort to maintain output at 55 million tons a year and had started to use a chemical reagent which was expected to increase the recovery rate from 40 to 60 percent, Fang said.

In East China's Shandong Peninsula, the Shengli Oilfield had seen a slight increase of 103 tons in oil output in January to hit 91,813 tons, according to the CNPC official.

Shengli, the second largest oilfield in China, is expected to turn out 33.5 million tons of oil and 1.55 billion cubic metres of natural gas by 1995, he said, adding that it had

adopted new technology in seismic surveying and directional drilling to increase the extraction rate.

The Xinjiang Oilfield produced 571,000 tons of oil in January, about 20,000 tons more than the same period last year and outstripping the State plan by 7,900 tons.

The CNPC official said this year's production target for the oilfield would be difficult because it would have to increase output by a further 220,000 tons after a growth in output of 400,000 tons last year.

He said workers at the oilfield, located in the Xinjiang Uygur Autonomous Region in Northwest China, had to suffer temperatures of 20 degrees Centigrade below zero.

According to CNPC, the oilfield is expected to reach an annual production target of 8.7 million tons by 1995.

Yumen, the oldest oilfield in China, had exceeded the State target by 350 tons last month despite cuts in manpower and equipment, the official said, explaining that a large amount of labour and equipment had been moved to the Turpan-Hami Basin in search of more oil reserves.

In addition to maintaining its monthly output at 500,000 tons, the oilfield had to step up oil exploration in the basin so as to give impetus to the country's oil industry in the next decade, the official said.

The Yumen Petroleum Administration, he said, planned to build two oilfields in the Shanshan and Qiuling areas of the Turpan-Hami Basin with a capacity of 500,000 tons this year.

Erlian Field Said To Be Completed

91B0032e Beijing RENMIN RIBAO in Chinese
23 Dec 90 p 1

[Excerpt] Hohhot—One important item in the Seventh 5-Year Plan, in an up-and-coming petroleum base, is Erlian oil field, which after an all-out struggle by the staff and workers of the Huabei Petroleum Administrative Bureau, stands completed. Up to 22 December of this year its crude oil output was 900,000 metric tons, 2.57 times that of last year, as it strides into 1991 ahead of schedule.

Erlian oil field is located on the Xilin Gol grasslands of Nei Monggol. Its completion and operations is of important significance to the glory and development of the Nei Monggol people's economy.

In the last year, the 3,000 employees of the Erlian Petroleum Prospecting and Development Corporation engaged in the development and administration of the oil field, faced problems of low permeability in the oil field, and dreadful natural conditions of cold and high winds. The leadership and much of the organizational cadre spent the entire year on the front line, and organized production with utmost efficiency. At the same time, they exercised scientific management, collected exhaustive records and data, perfected the exploitation of the well system, made good surveys, strengthened technical transformation, and in all aspects raised the administrative and development level of the oil field. [passages omitted]

Outlook Bright for Xinjiang Thick Oil Development

*916B0040A Urumqi XINJIANG RIBAO in Chinese
13 Dec 90 p 1*

[Article by correspondent Yang Xiuming]

[Excerpt] [passage omitted] Exploration of the thick oil reserves of Karamay oil field first began in November 1986. By the first one-third of the month of November this year—a span of only four years—3,678,567 tons of thick oil had been produced, fulfilling a 50-percent annual increase specified in the National Production Plan, and making possible an annual production capacity of some 1.2 million tons of thick oil. Its pace of development leads the nation.

The thick oil reserves in Karamay oil field are distributed over a large area and the reserves are large. Thick oil reserves explored and verified account for about 40 percent of the total reserve in the oil field, and the quality of oil is superior. However, because of the complex geological structures and low compression from the geological strata, the thickness and the high viscosity of the oil, exploration and extraction is more difficult. The Bureau first grasped and stuck to reforming the management system and contracted engineering work to different contractors. The Bureau also insisted on holding and organizing thick oil exploration campaigns. All participating engineering and work units also practiced item management and contracting and subcontracting of engineering work with full accountability placed on the contractors and subcontractors. The Bureau actively introduced and learned from both domestic experiences and from abroad, advanced boiler technology and organized and started technological breakthrough campaigns. In so doing, technological hurdles were overcome and six large thermal heat supply points were built. Forty-five high-pressure boilers were put into operation and high-temperature, high-pressure dry steam from the boilers was successfully injected into the sub-strata, enabling the high-viscosity thick oil to melt and be brought to the surface.

In the first half of this year, some 644,000 tons of thick oil were produced, an increase of 45 percent over the corresponding period last year. In the first third of November, the daily production level rose to 4,481 tons, a big jump from 4,200 tons in September. The daily production level increased by 1,136 tons, when compared to the corresponding period last year. From the beginning of the year to 10 November this year, total thick oil production was 1,205,496 tons, 160,000 tons more than the total production for the whole of last year.

Rich Reserves Reported in Shaanxi Natural Gas Field

*916B0040B Xian SHAANXI RIBAO in Chinese
2 Dec 90 p 1*

[Excerpts] The natural gas field now under exploration in Yulin in northern Shaanxi Province has a very large reserve and may become the nation's largest natural gas field, a spokesman for the China Oil and Natural Gas Corporation disclosed at the exploration site a few days ago.

The first natural gas well in northern Shaanxi was drilled in Mawan Village, Mapen County, Zizhou District, by the 3rd Drilling Company of Changqing Oil Exploration Bureau on 27 March 1986. The gas well reached a depth of 2,800 meters with a daily production of 30,000 cubic meters. After this discovery, the Changqing Oil Exploration Bureau focused their exploration activities on the Shaanxi, Gansu, and Ningxia Basin natural gas in the Yulin area. Of the 12 oil rigs available to the Third Drilling Company of the Bureau, 11 have been placed in nine counties, including Jingbian, Wanshan, and Zizhou. The total area of exploration is 8,000 square kilometers, with a total of 50 wells drilled, all of which produce natural gas. Many of them are high-output wells with a daily production of over 100,000 cubic meters. The highest output well has a daily output of some 300,000 cubic meters. This is especially the case with the Jingbian and Wanshan area where larger and higher output gas fields are found. On the basis of preliminary analysis of the drilling data, the experts found that the area of exploration is large, the area to locate gas rigs is large, and the gas-forming geological strata has a lot of combinations, which facilitates exploration. Five industrial gas well strata have been discovered, mostly coal-produced and biological gas type. The gas produced can be refined to produce petrol, coal gas, diesel fuel, and bitumen. Moreover, it is an important raw material for the production of plastics, synthetic fibers, synthetic rubber, and chemical fertilizers. As a fuel, its thermal energy is twice that of coal. Its combustion coefficient can reach 9,000 kilocalories per cubic meter. It is the best fuel for the manufacture of glass fibers, high-quality pottery, porcelain, etc.

[Passage omitted] An investment of 30 million yuan was made by the China Petroleum and Natural Gas Corporation to lay a natural gas pipeline from Jinchuanbao to Yulin. A natural gas chemical plant with a yearly production of 30,000 tons of methyl alcohol is to be built in Yulin. Work on this project is planned to begin next year and is expected to be completed in 1992. Before 1995, a 600-kilometer natural gas pipeline will be laid from Jingbian to Xian and Xingping. [passage omitted]

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